THE

PEDAGOGICAL SEMINARY.

Founded and Edited by G. STANLEY HALL.

VOL. XI. SEPTEMBER, 1904. No. 3.

EDITORIAL.

One of the most interesting signs in modern pedagogy is the new interest in the education of primitive races, and especially the Orient. Among the most suggestive of all recent literature have been those books and articles that deal with education in China, Japan, India, and other eastern countries under the great ethnic religions. The history of education and, indeed, even of philosophy, does scant justice to the Mohammedans in the tenth and eleventh centuries. The debt of Europe to the work of these great scholars is only now beginning to be appreciated. Those who read the first article of this number of the Pedagogical Seminary will find some indication of the rich field that invites still further exploration here.

In the next article Professor and Mrs. Chamberlain print some results of their observation of their own child, which constitute a valuable addition to these monopaidic studies.

Mr. Wilson's Bibliography of Child Study for the last year includes 486 titles. As usual he has taken a large view of the subject, and the notes on the more important papers add greatly to the value of this list.

In Germany speech defects have been studied in recent years with renewed assiduity and fruitfulness. Mr. Conradi has gone over all the important literature upon this subject and made in

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some sense a digest of it as well as added independent contributions of his own.

Professor Hodge here prints the first of two articles descriptive of a new biological movement which he represents and which cannot fail to be of great interest to teachers and to parents.

A bibliography follows.

EDUCATION AMONG THE MOHAMMEDANS IN THE MIDDLE AGES.

By Miss Kate Stevens, London, Eng.

The Mohammedan or Islam Empire was founded by the Prophet Mahomet, who was born at Mecca, in Arabia, A. D. 571, and died at Medina, 632 A. D.

The foundation of the Moslem religion, dates from the Hegira or Flight, when Mahomet first proclaimed his divine mission openly, announced his simple creed which was "There is only one God and Mahomet is His Prophet"—and openly denounced the idolatry of his countrymen. This brought on him the bitter animosity of his own family tribe, the Koreishites, who were the keepers of the Kaaba or Sacred Temple containing the Meteoric stone and three hundred and sixty idols. They sought to kill him, but he escaped to Medina, with his small band of followers, and there founded his religion. He professed to have visions, in one of which, he said, the Angel Gabriel appeared to him, and gave him the instructions for the conduct of his religion and life. This was the basis of the Koran or Arab Bible; which has wielded so great an influence in the Mohammedan world.

In Medina a Mosque was built for the Prophet, and here he preached with eloquence and power. His enthusiasm, endurance, talents and belief in his mission, drew many converts, and soon he found himself at the head of quite an army.

In character, these Arabs were brave and warlike, fond of plunder, and simple and rude in their life. They were restless, fond of freedom and independence, and bold to act and patient to suffer.

Up to this time Mahomet had been preaching patience, meekness, and benevolence, but finding himself now the leader of this fervent, restless, enthusiastic army he added the sword to the preaching as an instrument of conversion, and set up his standard of battle. Later he entered the holy city of Mecca in triumph, took possession of the Kaaba and destroyed its idols, and turned it into his own temple. He created Mecca his capital, and sanctioned and enjoined pilgrimages to be again religiously made to the now purified and holy Kaaba. Although he was unlettered, and ignorant, it is said, in his early life, of either reading or writing, and is called by his own

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followers "The Illiterati," he was a man of marked ability and influence—no ordinary man. He has been the means of influencing millions of the human race. He died at Medina, A. D. 632.

Dr. Draper says of him, "He raised his own nation from Fetichism—the adoration of a meteoric stone, and from the basest of idol-worship; he preached a monotheism which quickly scattered to the winds the empty disputes of the Arians and the Catholics, and irrevocably wrenched from Christianity more than half, and that by far the best half, of her possessions, since it included the Holy Land. Mahomet was a preaching soldier, he was eloquent in the pulpit, valiant in the field." During the ten years in which Mahomet ruled, a wonderful change was wrought in the lives and characters of the Arabs. He found them, consisting of various, often hostile, tribes—he welded them by his great religious idea into a nation. Tribal disputes were ended, and trade and commerce greatly developed. The style of dress and manner of living became more civilized. Gambling and drunkenness were prohibited; cleanliness, and kindness to animals were enjoined. The women were now secluded in private apartments; polygamy was still allowed but restricted to four wives for one man.

His doctrine that all alike, rich and poor were equal in the sight of God, tended to democracy.

After the death of Mahomet, A. D. 632, comes the period of the "Unidivided Caliphate," or of the four Orthodox Caliph, lasting 632-661. During this period of the Republic, the policy was still to consolidate, and form one nation of the Arab people, and its territory was rapidly extended.

At first, life was austere and serious, but in the reign of Othman the old gay reckless life of Mecca began to assert itself, among the younger generation. Foreign architects had rebuilt the Mosque now called the Mosque of Omar, and more splendid buildings came in vogue. Greater luxury was to be seen. At Medina, life was still serious, and more staid. The lecture rooms were well filled by students of both sexes. Music was the the principal recreation of both men and women.

So rapidly did the Mohammedan empire spread that, within a century of its formation, it reached its greatest limits. It stretched from the Atlantic to the Indus from W. to E. and from the Caspian Sea to the Cataracts of the Nile from N. to S. The chief instruments of its extension were, on their side, the Koran and the sword wielded by a wild enthusiasm for their new faith; by treachery, treason and religious dissensions in the Roman Empire, which made them an easy prey. It was quickly consolidated by the religious inspiration drawn from one central and unifying idea, and also by the prevalence

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of polygamy, which led to very large families, the sons growing up speaking only the Arabic tongue and proudly claiming to be of Arab descent through their fathers.

The early and stormy days of Moslem conquest were not favorable to learning. Very few of the earlier followers of the Prophet were acquainted with any book, save the Koran and later the Traditions. They were taught that the Koran contained all that it was necessary for them to know, 'as it was inspired.' As the Koran contains no sentence favorable either to literature or science, these subjects were, at that time, looked upon with indifference or scorn by the Arabs. When more peaceful days arrived, leisure to study was found, and learned Jews and Christians were invited to teach the Arabs and settle among them, with freedom to practice their own faith.

Ali, the Caliph, was the first to encourage literature, and Moawiya encouraged both literature and science. "By one of those singular but unaccountable revolutions, which mark the history of the Arabians, no sooner had their minds received the proper impulse, than they overran the departments of science with the same facility with which they had overspread the provinces of the East."—Murphy.

The Golden Age of Arabian learning appears to be in the 10th and 11th centuries A. D. They were then the preservers as well as the dispensers of knowledge. The period of Moslem greatness corresponds to the period of deepest gloom or the 'Dark Ages' of Europe.

Of this time Brooks Adams remarks: "In the 11th century the Saracens were then in the full vigor of their intellectual prime and the meridian of their material splendor. When Paris was still a cluster of huts cowering for shelter on the islands of the Seine, and the Palace of the Duke of Normandy and King of England was the paltry White Tower of London, Cairo was being adorned with those masterpieces which are still the admiration of the world." All our great authorities on the subject acknowledge the great debt which Europe owes to the Arabs during the Middle Ages.

"At the period when ignorance and barbarism prevailed through every part of the Roman empire, literature and philosophy found an asylum among the Arabs, and by a singular revolution in the history of nations, Europe became indebted to the mortal enemies of her religion and arms, for the first lessons of science and learning."—Murphy.

"For nearly three centuries, under her Mohammedan rulers, Spain set to all Europe a shining example of a civilized and enlightened state. . . . Art, literature, science prospered and they prospered nowhere else in Europe. Students flocked from France, Germany, and England to drink from the fountain of

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learning which flowed only in the cities of the Moors. . . . In Andalusia the Moors organized that wonderful kingdom of Cordova, which was the marvel of the Middle Ages and which when all Europe was plunged in barbaric ignorance and strife, alone held the torch of learning and civilization, bright and shining, before the Moslem world. When we remember that in the 10th century, at the height of the glories of Cordova, our Saxon ancestors dwelt in wooden hovels, and trod upon dirty straw, when our language was unformed, and such accomplishments as reading and writing were almost confined to a few monks, we can to some extent realize the extraordinary civilization of the Moors. And when it is further recollected that all Europe was then plunged in barbaric ignorance, and savage manners, and that only where the remnants of the Roman Empire were still able to maintain some trace of its ancient civilization, only in Constantinople and some parts of Italy were there any traces of refinement, the wonderful contrast . . . will be better appreciated."—S. Lane-Poole.

"It was through the labors of these learned men (Arabs) that the nations of Europe, then shrouded in the darkness of the Middle Ages, became again acquainted with their own proper, but unused and forgotten, patrimony of Grecian science and philosophy."—Sir Wm. Muir.

"What Europe owes to the labors of the Arabs in scientific research, can never be sufficiently acknowledged."—Dr. Leitner.

"The Revival of Learning in Europe is chiefly attributed to the writings of Arabian doctors and philosophers, and to the schools which they founded in several parts of Spain and Italy. Europe is also indebted to the Arabs for many useful sciences, particularly that of chemistry."—Arbuthnot.

We will now look in more detail at the progress and influence of learning under the various important dynasties, after the disintegration of the whole empire began in 750 A. D.

Sir Wm. Muir thinks that sufficient importance is not attached to the share taken by the Omayyads in the East, in their encouragement of learning, "for," says he, "It is clear to me, that the palmiest days of Islam after those of Abu Bekr and Omar, were the Omayyad Muavia (661-670) and Wedid I (705-715) who are not eclipsed either by Haroun (786-809) or Mamun (813-833). The tendency of the annals on which we are dependent, written as they are, under the influence of Abbaside supremacy, is to exalt that dynasty at the expense of the Omayyad."

Music, arts and poetry and literature, in a lesser degree, were encouraged at this time.

Under the Omayyads there were not only male, but female,

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poets. Their pieces are mostly short and do not represent profound thought or wisdom; they are mostly in praise of heroes or women, and form a picture of the feelings of the people and their mode of life at the time.

Under these Caliphs schools began, and by the appointment of many Greeks and Syrians to important posts the Arabs were brought into contact with Greek civilization.

Of the Abbaside Caliphs, three deserve special notice for their magnificent patronage of learning in all its known branches. These are Al-Mansur 754-775 A. D.

Haroun Al-Rashid 786-808.

Al-Mamun 813-833.

Under these monarchs learning and culture greatly advanced. They invited learned men from all parts of the world to their courts, and remunerated them with princely rewards. The works of the best Greek, Syrian and Persian authors were procured, translated, and copies spread to all centres of learning in their empire. In medical literature they became so proficient that through the Middle Ages the Arabs were regarded as the highest authorities.

Mansur founded Bagdad in A. D. 760 and transferred the capital from Damascus to that city.

In the reign of Haroun the mechanical arts were so far advanced that we hear of his sending a wonderful mechanical clock as a present to Charlemagne. Haroun made a law that no Mosque should be erected without having a school, for the people's children, attached to it. He also placed the superintendence of all his public schools under a Nestorian Christian, named John Masué, of Damascus, a learned and able man, also a notable Greek scholar.

Haroun was the first to raise music to a profession by conferring degrees and honors as in science and literature. Hanifa's celebrated School of Law was also established in his reign. In his reign no poetry attained its highest degree of perfection. His wife, the Empress Zaibaida, was a cultured woman and an accomplished poetess. The ladies were exceedingly fond of poetry and frequently took part in poetical recitations.

The Caliph Mamun, 813-833, has been called the 'Augustus' of his time and country. His court became the resort of a brilliant throng of poets, philosophers and mathematicians. To it, came the learned and wise from every country, whom he entertained with munificent liberality. Unstinted patronage was given to art, science, and literature of every kind.

During his reign extensive libraries were collected at Alexandria, Bagdad and Cairo. He sent agents abroad to find and secure valuable manuscripts, and hundreds of camels were employed in bringing these books to Bagdad. Many of these

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CHIEF NAMES OF NOTE IN VARIOUS BRANCHES OF LEARNING IN CONNECTION WITH MOHAMMEDAN EDUCATION OF MIDDLE AGES.

CENTURY.	CENTURY AND CHIEF PATRONS.	THEOLOGY.	GRAM. AND PHILOLOGY.	POETRY.	LAW.	PHILOSOPHY.
8th	Abdul-Malik 684-705 Walidi 705-715 Al-Mansur 754-775 Al-Mahdi 775-785	Imam Hanifa 767 " Malik d. 795	Abdul-Aswud d. 688 (Father of Arab Gram.) Al-Khalil 718-786 Sibawaih d. 787	Al-Mofaddhal 784 Al-Farazdak 728 Abu-Nuwas 810	Abu-Hanifa d. 767 Obiad-Allah 720 Orwa d. 712 Kasim 719 Said 710 Sulaiman 725 Abu-Bekr 712 Kharija 718	Imam Jaafer k. 802 Hassan d. 728 Wasi-b-Aata 748
9th	Yaha d. 805 Haroun-al-Rashid 786-809 Vaihaida Fadhl 809 The Barmecides Al-Mamun 812-833	Imam Shafai 820 " Hanbal 855 Az-Zahariah 883 Al-Bukhari 870 Muslim 875 Abu Dawnd 889 Al-Hazini 887	Katrub 821 Al-Muharrad 898 Shaibani 825 Thaleb 903 Al-Ansari 830 Al-Farra 822 Al-Asmai 831 Abu-Obaida 824 Abu-Othman 863	Abul-Atahya 826 Al-Otbi d. 842 Abu-Tammam 845 Al-Boktori 821 897 Mutanabli		Al-Kindi 861 John Mesue
10th	Rahman III 912-961 Hakim II 961-976	Abu-Awana 916	Ibn-Duraid 933 Al-Kali d. 967	Mutannabi d. 965 Al-Ispahani 967	Kadi-en-Norman	Al-Farabi 950 Al-Tarhadi 985 Al-Majirdi 1004
11th	Hakim (Egypt) 996-1020 Abd-Allah (Granada)		Ibn-Babshadn 1097	An-Nami 1008 Hafsa (woman) Al-Ansari "		Avicenna 1037 Ibn-Ridhwan 1067 Abu-r-Rakamak 1008 Al-Zhazali 1058-1111
12th	Salidin 1171-1193 Ka'alun 1279-1290		Abu-en-Nigiram 1126 Al-Naruyyich 1072 (woman)	Al-Hariri 1055-1122 Al-Yatima (woman)	Ul-Muniazzid (woman)	Ibn-Bajah 1138 (" Avempace) Averroes 1126-1198
13th			Ibn-Malik 1273	Ibn-el-Garrah 1219		
14th						Al-Gazali 1343 Kacehevem

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CELEBRATED MEN.—Continued.

CENTURY.	LEXICOGRAPHY AND HISTORY.	GEOG. AND TRAVELS.	ASTRONOMY AND MATH.	NAT. HISTORY.	MEDICINE AND CHEM.	MUSIC.
8th	Yamakhshari Sibawaih 787		Al-Fazari		Khalid 704 Georgios 771 Bakhtiashu	Almansaly
9th	Al-Wackidi 822 Balazari 892 Al-Madaini 839 Tabari 838-923	Ibn-Humair 845 Ibn-Khordabeh 912	Al-Farghani Yabya	Al-Jahiz 869 (plants)	Gabriel 828	Abu-Muhammad Mosuli
10th	Al-Masudi 957 Kadi-en-Norman El-Kindi 961 Ibn-Yunis 958 An-Nadim "(Fihrist)" Al-Faribr 950	Al-Marvazi Ibn-Haukal 976	Al-Battani 930 (Alhalegnius) Lupito of Barcelonia		Rhases 923	Al-Farabi
11th	El-Kuda 1062	Al-Beiruni 1038 Al-Bakri 1094 Nasir Khusrai	Ibn Yunis 1009 Ibn-un-Nahdi 1040 Avzachel 1080	Al-Beruni 1038	Albucasis Avenzoar	
12th	Shuda (woman)	Idrisi 1164	Umar Khayam 1123 Geber	Ibn-Beytar (Botany)		
13th	Ibn-al- Arthur 1160-1223 Ibn-Khallikam 1282	Yakut 1229		Ibn-el-Beithar 1248		
14th	Abul-Feda 1345 Ibn-Khaldun 1332-1403 Ibn-Hajar 1449 Al-Markrisi 1442	Ibn Batuta				Kalelbeveus

which were thought to be suitable, were translated into Arabic, copied, and dispersed among the people. The Caliph diligently cultivated literature, and established excellent schools in Bagdad, Bassorah, Bokhara and Kufa. In his time, too, literary clubs were established, where scholars congregated to hold philosophical discussions. Social evenings and conversations were held at the homes of the great—in which ladies took an important part.

Booksellers occupied an important place in society, as their shops were the rendezvous of students and the learned.

The splendor of the buildings devoted to learning, attest to the high estimation in which it was held. Fez and Morocco also possessed fine establishments for public instruction, where learning was ardently pursued. There is said to have been twenty schools in Alexandria.

Out of the ardent pursuit of astrology and alchemy arose astronomy and chemistry. In searching to find the philosopher's stone and the elixir of life, valuable scientific discoveries were made. They understood the composition of nitric and sulphuric acids, of aqua regia, besides the preparation of mercury and various oxides of metals. They found out the use of gunpowder.

In medicine they were far in advance of Europe, where the Church professed to cure by miracles and forbade experimental methods of treatment. The famous Rhazes superintended the hospitals in Bagdad, and in the 10th century, wrote a medical work of ten volumes. Physicians of all countries have used his treatise on small-pox and measles. He died in 932. Dispensaries were also founded.

In 833 Mamun founded observatories at Bagdad and Damascus, and caused a degree to be measured on the Plain of Palmyra.

In his reign medicine, mathematics, jurisprudence, and astronomy made great strides and they invented the mariner's compass. As early as 1000 A. D. spherical trigonometry was in use and Aboul-Hassan wrote a valuable treatise on conic sections.

By the close of the Abbaside Dynasty in the East, in 1258, the Arabian astronomical instruments were comparatively perfect.

Under the Abbaside Caliphs there was an organized Imperial Postal Service with the Sahib-ul-Barid or Postmaster General. Accurate postal Directories were also kept and carrier pigeons used for postal purposes. Provisions were inspected, weights and measures tested, and public nuisances suppressed. There was an organized and efficient police service. Merchants formed themselves into Guilds or Corporations. For the use of pil-

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grims going from Bagdad to Mecca, houses of rest and cisterns of water were constructed along the whole route. Great attention was paid to the administration of justice. In the courts we are told that no one could be a witness unless he bore a good character. Agriculture and irrigation were brought to a high state of perfection.

The Manufactures were very important. Bassorah was famous throughout the world for its glass and soap. Paper was made. Gold embroidery, silk, satin, brocade and carpets were of high quality and often of exquisite texture. Kufe was famed for its silk. "At Susangird there was a royal factory for gold embroidery, of damask, camel-hair goods, and carpets." The country was famous also for its glass and metal work.

The high state of perfection in all the arts, points to an efficient training and education, for the purpose of those engaged in carrying them out.

During war, army doctors, hospital appliances and ambulances carried by camels formed a part of the equipment.

Professors of Law or Theology wore a kind of hood which formed the model for those still worn at Oxford or Cambridge.

The Arabs were great travellers and colonizers. They discovered the Azores and the knowledge of geography was greatly extended.

Valuable works were written on history; books were also found on archæology, ethnology, statistics and natural history. Valuable biographies and lexicons were compiled. On the 'exact sciences' to which the Arabs were specially devoted, the writings were voluminous; also on philosophy and metaphysics. Amongst the philosophers the most noted were Al-Kindi (d. 861), Farabi (d. 950), and Avicenna (d. 1037).

Caligraphy became a fine art and beautiful specimens were highly prized. The most noted in this art were Abu Hassan and Abu Talile.

The "Brothers of Purity" formed the first association for the general spread of knowledge and purity.

Turning now to Mohammedan Spain we find there a like 'Golden Age of Learning' which culminated in the 10th century in the reigns of Abd-er-Rahman III, A. D. 912-961 and of his son, Hakim II, 961-976.

These monarchs were also munificent patrons of culture and learning.

As soon as the Omayyad rulers in Spain had consolidated their conquests they began to cultivate literature and science, to found libraries and splendid establishments for their spread: students from all parts of the civilized world flocked to Cordova, their capital, which became, in the West, as a centre for culture and learning, what Bagdad was in the East.

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The Spanish Arabs were themselves fond of, and devoted to, learning we are told. Dr. Leitner says of the Arabs: "Taking almost everything in Greek philosophy and science, the Arabs rejected its worship of the human form and its delineation of human passion on the stage. But in the rigid studies of history, logic, mathematics, astronomy, medicine, including botany and zoölogy, the Arabs were masters of exactness, and it is to them that one-sixth of the human race owes its civilization."

The capital, Cordova, contained at this time a million of inhabitants, 3,800 mosques, 60,000 palaces and houses of the nobility, 200,000 houses for the people, 700 baths and 80,000 shops. Its size was 24x6 miles and it is said one could travel ten miles in one direction, through its lamp-lit streets. Beyond this again, were the suburbs. Its palaces, gardens, libraries and mosques were among the most famous the world has ever seen.

The Arab monarchs of Spain not only founded splendid libraries for their own use, as did all the greater nobility, but they also founded and endowed them in all their chief cities. The most famous library was the Royal Library of Hakim II. Of this sovereign, Ibu Khaldün the Arabian historian, says: "He loved literature and the sciences and showered his munificence on men of learning." He spared neither trouble nor expense in forming this library in his Merwan Palace. He sent collectors to Egypt, Syria, Irak and Persia to find rare and valuable manuscripts and bring them to Cordova. When a book could not be bought he would have it copied. Ameer Ali says: "The publication of original works was encouraged by munificent donations and every endeavor made to obtain first copies." He employed a staff of copyists, illuminators and book-binders at his palace. This library is said to have contained 600,000 volumes, and this when printing was unknown. This library at the Merwan Palace was not only the finest in Islam, but the most carefully arranged. The catalogue, a volume of 2,200 leaves, contained the titles of the books, the author's name, descent, birthplace, and, if deceased, the year of death. Hakim is said to have not only collected, but to have read his books. He also made copious notes in them himself. So learned was he that his marginal notes, in later times, were highly prized by scholars.

Public libraries existed in all the great cities of Spain; Cordova, Granada, Seville and Toledo, were noted for the magnificence of their libraries, colleges, academies and schools, which were of world-wide reputation. No town, however small, was without colleges and schools, and each large city had a university of its own. The high school of Cordova rivalled that of Bagdad.

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The schools were graded first the lower or primary schools, attached to the mosques—where in many cases, in addition to instruction, the children were clothed and boarded gratuitously. In these they were taught Religion, Reading and Writing. The teachers were generally the priests. The lessons were generally learnt and verbally recited. There was no remuneration besides small free-will offerings of the pupils to the teacher.

Dozy says, "In Spain, almost everybody knew how to read and write, whilst in Christian Europe, save and except the clergy, even persons belonging to the highest ranks were wholly ignorant."

Hakim II benevolently established in Cordova twenty-seven elementary schools; where poor children were educated free, and their books provided by the State. Over the entrance to every school were inscribed the following words "The world is ustained by these things only: the learning of the wise; the justice of the great; and the valor of the brave."

The High Schools and Colleges were generally attached to the Mosques of the highest rank. The teachers were mostly secular and philosophers, but under priestly control. They were sometimes quite independent. Each academy and school was governed by a rector, chosen from among the most learned men. In spite of the narrow and bigoted principles of Islam we find great liberality both in the East where Haroun employed a Christian, John Marsué, to superintend his schools, and in Spain where Jews were appointed to superintend the College at Cordova, thus showing that, in their opinion, learning was of greater importance than religious opinions.

Casiri tells us that the academies were accustomed to hold public meetings to which the people were invited. On these occasions poems were recited, and orations given, by the most eminent persons in the academy. In the High Schools of Cordova, Toledo, Salamanca, and Seville, nearly all branches of human knowledge were taught. Mohammedan theology and law; mathematics and astronomy; history and geography; grammar and rhetoric; medicine and philosophy. In these schools Mohammedan, Jewish, and Christian teachers, worked side by side, in harmony. The students lived in colleges; some of these contained as many as thirty apartments, each occupied by three or four students.

From time to time the students had to pass examinations. The fame of the Arabian schools in Spain attracted students from all parts of Europe, who were anxious to acquaint themselves with Greek and Arabic literature, and to study the philosophy of Aristotle. A translation of Aristotle had exerted a powerful influence upon the Arabs. His ascendancy was paramount

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and universal. Averroes wrote elaborate commentaries on Aristotle's works. His teaching not only became the foundation of Arabic philosophy—for the Arabs believed that philosophy was only to be found in his writings, but through the influence of the Arabian schools the study of his works became popular among the Jews of Spain, and afterwards throughout Europe. Foreign students also repaired to Spain in order to study mathematics and medicine.[1]

Dr. Draper says, "Medicine received more and greater additions by the discoveries of the doctors and surgeons of Andalusia, than it had gained during all the centuries since the days of Galen. Albucasis was a notable surgeon of the 11th century, and some of his operations coincided with the present practice. Avenzoar, a little later, made numerous important medical and surgical discoveries. Ibn Beytar, the botanist, travelled all over the East to find medicinal herbs, on which he wrote an exhaustive treatise."

Stanley Lane-Poole says, "The surgeons and doctors of Andalusia were in the van of science; women were encouraged to devote themselves to serious study, and the lady-doctor was not unknown among the people of Cordova." Spain at this period was the birthplace of chivalry in which an exalted sense of honor and respect for women, hold so prominent a place. Ladies were present at the jousts and tournaments which were held, also at the public festivals. Polished courtesy distinguished the Arab cavalier.

Spain equally with the East, was noted for her arts and manufactures, which were of world-wide celebrity.

Her buildings of Saracenic architecture have never been surpassed, *e. g.*, the Alhambra at Granada, the Mosque and Palaces of Cordova and that of the "City of the Fairest" in the suburbs.

In no country has agriculture and irrigation risen to such perfection. The Arabs raised agriculture to a science. They constructed aqueducts and procured an abundant water supply and cleanliness was scrupulously enforced.

In Egypt the Fatimid Caliphs ruled A. D. 909-1171 and some of them were liberal patrons of learning and science. They established schools, colleges, public libraries, and scientific institutes. The most noted of these was Hakim, A. D. 996-1020. He was a munificent patron of learning and science and built many mosques, colleges, and observatories. In 1005 he erected a "Hall of Science" at Cairo for the study of theology, astronomy, lexicology, grammar, poetry, criticism, law and medicine. It was a fine building, with a splendid library,

[1]Among the celebrated foreign students was Gerbert, a learned Frenchman, who afterwards became Pope Sylvester II.

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open to the public. There was a large staff maintained to work it. Books and mathematical instruments and writing materials for the use of the students, were provided free. Attached to the "Hall of Science" was a "Grand Lodge" at which the Grand Prior, who, as a rule, was the Vizier, held meetings on Mondays and Wednesdays, which were attended by both men and women, who occupied separate places, and were all dressed in white. This Grand Lodge afterwards became the model for all the Freemason's Lodges of later years.

Cairo possessed an immense number of colleges. Ameer Ali Syed says: "The early Fatimids, like their ancient prototypes the first Ptolomies, were grand supporters of learning and science. The Caliphs frequently held learned disputations, at which the professors appeared dressed in their Khalaa or doctoral mantles. Two hundred and fifty-seven thousand ducats, raised by a carefully graded taxation, constituted the annual revenue of the colleges, and was employed for paying the salaries of the professors and officials, and providing the requisites for teaching, and other objects of public scientific instruction. In these institutes they taught every branch of human learning. Observatories for the cultivation of astronomy were erected in various places, and litterateurs and scientists were invited, from Asia and Spain, to give lustre to the reigns of these Moslem Pharaohs."

The Royal Library at Cairo consisted of 100,000 volumes, elegantly transcribed and handsomely bound. These books were arranged round the room in locked presses, having on them a list of the contents of each press. The staff consisted of the librarian, two copyists and two servants. It contained many MSS. of priceless value. Kairowan, Fez, and other large cities of N. Africa possessed splendid schools and libraries, in which were preserved many valuable works. The library of Fez possessed a complete copy of Livy in Arabic.

When Kala'un, Sultan of Egypt, A. D. 1279-1290, was lying dangerously ill in a hospital at Damascus, he vowed that, if he recovered, he would build a hospital at Cairo. He did so, and the famous Maristan, the first hospital in Cairo, was completed in 1284. In the hospital there were wards for every known disease, a regular medical staff, lecture rooms, laboratories, operating theatres, surgeons' room, dispensary, cells for mad patients, professors' lodgings, baths, kitchens, and every appliance then known. Musicians played to soothe the patients, and in the adjoining mosque fifty Koran readers were maintained to administer the consolations of religion. A librarian had charge of a splendid collection of medical, theological and legal books. Rich and poor were here alike treated gratuitously.

In Cairo it was the custom for the Achimbasi or chief physician, most rigidly to examine medical students and after they

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had successfully passed the examination they received diplomas authorizing them to practice.

In the reign of the Mamluk Sultan Nasir Mohammed, 1293-1340, was again a period of literary brilliance. He was a clever man and an appreciative patron of learning. The architecture of this period is considered to be the climax of the history of that Saracenic art in Egypt.

No account of Moslem Education would be complete, however slight, without some reference to the Koran which exerted so wide an influence upon the Arab life and education.

It is termed the inspired 'word of God.' Koran means 'recitation' and Mahomet always asserted that he only recited what had been divinely revealed to him. It is divided into 114 suras or chapters and 6,666 verses. It was not collected or arranged until after Mahomet's death.

Mr. Badger says: "It embodies the utterances of the Arabian Prophet, on all subjects, religious and moral; administrative and judicial; political and diplomatic; from the outset to the close of his career; together with a complete code of laws for regulating marriage, divorce, guardianship of orphans, bargains, wills, evidence, usury, and the intercourse of private and domestic life; as they were dictated by him to his secretaries and by them committed to writing on palm-leaves, the shoulder-blades of sheep, and other tablets."

These it appears were thrown pell-mell into chests, where they remained till the reign of Abu-Bekr, the immediate successor of Mahomet. They were finally issued, as a text, by Omar and all previously existing copies burnt.

This is the text now in general use amongst Moslems.

Summary of Teachings of Koran.

I. Articles of Faith.
   (1) Belief in Allah or God.
   (2) Belief in Messengers or Angels.
   (3) Belief in the Books of Scripture and in the Prophets.
   (4) Belief in Hell and Paradise.
   (5) Belief in a general Resurrection and final judgment.
   (6) Belief in the decrees of God, of His having absolutely predestined both good and evil.

II. The five cardinal ordinances of Islam are
   (1) The pious recitation of the Kalimah—"There is no God but the one God and Mahomet is his Apostle."
   (2) Prayer.
   (3) Fasting.
   (4) Legal and obligatory almsgiving.
   (5) Pilgrimage.

III. Other points were
   (1) Circumcision.
   (2) Marriage and polygamy.
   (3) Slavery.
   (4) Holy War.
   (5) Food, drink and ablutions.

(Hughes' Dictionary of Islam.)

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Grateful acknowledgments must be made to the Lectures of Prof. Earl Barnes, which the writer was privileged to attend and which first interested her in what has proved a very fascinating field of study; also to notes on the period lent by him.

Sources of Reference.

In writing this paper the following reference books have been freely used; mainly at the British Museum.

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STUDIES OF A CHILD. I.

By ALEXANDER F. and ISABEL C. CHAMBERLAIN.

OUTLINE.

Introductory.
I. Affirmation and Negation.
II. Analogy, Transferred Meaning, etc.
III. Argument and Expostulation.
IV. Comparison.
V. Definitions.
VI. Fear.
VII. Imagination, etc.
VIII. Nature—Observation, etc.
IX. *Obiter Dicta*.
X. Poetry and Song.
XI. Righthandedness.
XII. Stories.
XIII. Spontaneous Formation of Words.
XIV. Spontaneous Language.
XV. Talk.
XVI. Time.

Introductory. The subject of these notes is R– (first and only child), daughter of the authors, born August 3, 1901. She has been perfectly healthy from birth, is of an active and cheerful disposition, with great affection and a lively imagination. As far as possible, her parents have avoided imposing things upon her by direct teaching. She had always had numerous playthings and the continuous companionship of both parents. The period covered is chiefly her third year. No attempt to be exhaustive is made (some topics may be treated later in detail) and a number of matters not now considered will be discussed on some other occasion. The data here presented have been obtained and recorded with due care and precision, and in no case has theory been allowed to twist facts. The sections on spontaneous word-forming and spontaneous language are believed to contain some new and interesting data, which may contribute somewhat to the solution of the problems of "invention" in child-speech. Questions of psychological and pedagogical import only are dealt with in this first article. In the body of this paper the words and phrases recorded, unless otherwise stated, have their usual English sounds and significances.

I. *Affirmation and Negation.* She learned to use "no" much before "yes," in part on account of the difficulty she

met in pronouncing the latter word. On the whole, her negatives have been more energetic than her affirmatives. During the month of April (April 15, 1904) she used "yes" and "no," besides the significant *mm-hm* ("yes"). In some fashion (seemingly her own invention) she has acquired the negative "nope," of which she is rather fond. Nodding and shaking the head are not regularly employed by her for affirmation and negation, and when they are used they occur rather as accompanying gestures of "yes" and "no." Nodding the head occurs oftener than shaking (she is very fond, however, of shaking and nodding her head in play). Of negative phrases she uses "no, at all" quite commonly, *e. g.*, "Wut dŏn' want zat. No, at all." She also uses "No, at all" in answer to direct questions. An interesting fact is her use of "any," "anything," "anybody," in the sense of "none," "nothing," "nobody." During the month of April, 1904, she employed them thus: "Any in there (= none in there)." "Any more pickas (pictures) in zat book (= no more, etc.)." "Anything in zis box. (= nothing, etc)." "Anybody did n't tome. (= nobody came)." "Anybody (= nobody)." in answer to question, Who's in there. Sometimes she uses "nothing" and "nobody" in their accepted senses. The affirmatives "tomebody," "tomebody else," "tumpin," "tumpin else," are regularly employed by her. Sometimes (formerly much more) she uses "nuzzer" (another) for "other," as in the phrases "my nuzzer dolly," "Zat 's my nuzzer dolly," etc. She uses "never" and "ever" in the common acceptation. Also "not yet," "not now," "not just yet," "not just now." She says often (June 17, 1904). "Has that got nothin' in it?" = "Is it empty?" By June, 1904, she had abandoned the use of "any" in the sense noted above. She now uses "yes" and "no" and *mm-hm*, the last frequently. She still uses occasionally *nope*.

II. *Analogy, Transferred Meaning, etc.* Following are the principal cases noted of items coming under this head:

1. *Moon.* On March 7, 1903, while sitting in her father's lap at the window, looking up at the sky, she discovered the new moon, which interested her very much. At the same time she noticed the smoke coming out of the chimney of the University. The evening of the same day she called the half of a biscuit in her hand "mooi'," *i. e.*, "moon." Among the things to which, between January, 1903, and April, 1904, she has applied the term "moo'," "mooi'," "moon," are: Moon (in various phases), cakes cut out of dough, round marks made on the frosted window with cake-cutter, writing with pencil or pen on frosted window, on on paper ("make moo' "), water-stains on ceiling, round things in books, the figure on

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the outside of Leland and Prince's "Kuloskap, the Master," and that on the back of Kayme's "Anting-anting Stories," faces on calendars and almanacs (also "man i' moo' "), round candies, discs, figures on wall-paper, carpets, etc., postmarks, the letter O, etc. On April 10, 1903, she said, without suggestion: "Baby wite (write). Up mama lap. Make moon. . . . Baby wite. Make man i' moon." The transition from "making moons" on the frosted window to "writing" on paper seemed to be quite natural for her. Although she first called the moon "moo'," "mooi'," "moon," the effect of her hearing the rhyme about "The Man in the Moon, etc.," was to make her, until very recently (April, 1904), call the moon "man-i'-moon."

2. *Wrinkles.* In May, 1904, she frequently spoke of the "wrinkles" on or in the warmed milk given her to drink, meaning thereby the "scum" on top of it.

3. *Bridge.* During May and April, 1904, and probably sometime before, she applied the term "bridge," to the threshold of the door, the wooden edge of the bath-tub, the window-sill, the stone-curbing on the street, low retaining walls, etc., the top of the stair-case, the top railing of the piazza, etc. While in Maine, during the summer of 1903, she first became acquainted with foot-bridges.

4. *Bubbles.* On June 1, 1904, she applied the term "bubbles" to the marbled inside cover of a book. Last summer she had a dress the pattern of which was of small dots blue on white, this she called her "bubble" and applied the term to any similar fabric. She first knew bubbles as applied by her mother to the soap-suds in the bath before she could talk, and used to say "blubla."

5. *Chocolate.* On February 20, 1904, she applied the term "chocolate" to the metal plates of the door-lock. This was evidently from analogy with the "bars" of sweet-chocolate she had been eating.

6. *Ice-cream.* Sometime in March she remarked of her rice and milk that it "looked like ice-cream,"—of this she was very fond.

7. *Banana.* In the spring of 1903 she called yellow string-beans, seen for the first time, "mnana," *i. e.*, banana. She became acquainted with bananas before knowing beans.

8. *White.* During the spring of 1904 she called silver money "a white one." A dime was "a little white one," a fifty-cent piece "a big white one." When offered a cent she would often say "I want a white one."

9. *Warm.* About March, 1904, she applied the term "warm" to any woolen material, as a sort of color-designation. *E. g.*, when her mother asked her to tell the colors of a number

of pieces of cloth, as she came to the woolen goods, after having correctly or incorrectly named the colors of the rest, she said it (a piece of pink flannel) was "warm." The same term she would apply also to blankets, shawls, etc.

10. *Scissors.* Her own first word for scissors, which she ceased to use sometime in March, 1904, when her mother bought her a pair of scissors for herself, was "tinga-ale" (then "tinger-ales"). This expression she undoubtedly made from observing her mother cutting her (baby's) finger-nails.

11. *Street.* On May 19, 1904 (she had been on May 14 to see the street parade of the circus), she pointed to the figures on the wall-paper of her bed-room, and saying "this is a tiger," "this is a lion," etc., she termed the wall itself "wall street," and said that the circus procession was going along it. This conception of the wall as a street is rather interesting.

12. *Bones.* In December, 1903, and January, 1904, she used to call prominent moles on face of a person of her acquaintance her "bones." This term she seems to have reached from feeling the moles and finding them to be quite hard.

13. *Hair.* Some time in April, 1904, when "pulling out" her father's whiskers, she observed, when asked to stop, that she was "pulling out horse-hairs."

14. *Piazza.* In the summer of 1903 she called the wharf at Bayville, Me., which had a guiding rail, "peepazza," from analogy with the piazza at home.

15. *Water.* In the fall of 1903 she applied the term "water" to the road in a forest picture hanging upon the wall.

16. *Indian.* On December 10, 1903, she was looking over Hiller and Furness' "Notes of a trip to the Veddahs of Ceylon," which has many illustrations. When she saw the frontispiece (a number of Veddas), she said at once "Indins-mans." This was natural, for one of the earliest books that attracted her attention was a volume of the Reports of Bureau of American Ethnology, or the "Indin book," as she called it. There were also numerous pictures of Indians elsewhere in the house, and she had seen some Maine Indians at Boothbay Harbor in the summer of 1903. It is curious to find her calling the Veddas "Indians," a thing the average adult would be apt to do on seeing the pictures for the first time.

17. *Island.* In the same book, opposite page 12, there is an illustration of a terraced water-field of rice, which she at once called an "island." On the sea-coast of Maine she had learned to know islands, and was, even in the summer of 1903, able to point out islands on a large chart of the Boothbay Harbor region.

18. *Flag.* Sometime during the fall of 1903, on seeing a barber's pole on Main Street, she called it "tlag," *i. e.*, "flag," from analogy with the U. S. flag at home.

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19. *Peppermint.* Anything with a bad taste she has recently (winter of 1903) called "pepint tuff," *i. e.*, "peppermint stuff,"—she has never liked the taste of peppermint candy.

20. *Turnips.* On April 10, 1904, she watched her father slice a pine-apple. After carefully examining a slice, she remarked, "Zese is des like turnips." She had seen turnips in the store and had watched her mother cut them up at home.

21. *Skeleton.* On April 7, 1904, she picked up an archeological pamphlet, opening it at a page containing a picture of a skeleton lying in a grave. She exclaimed at once: "Like zose at nuwersity!" About a month before, she had been taken by her father to his room in the University, where were several mounted skeletons of infants.

22. *State-Mutual.* While at Bayville, Me., during the summer of 1903, she termed the boarding-house the "Tate Muble." While in Worcester she had gone with her father and mother several times to a meal at the State Mutual Restaurant,—this seems to have left a very marked impression upon her mind.

23. *Lettuce.* On June 4, 1904, while in University Park, she said of the foliage-plants: "Are they lettuce?" She knows lettuce well.

24. *Wicket.* On June 5, 1904, while watching the rainbow, she said: "It looks like a wicket." She has been familiar this spring (and memory from last year may be present also) with croquet-wickets on the lawn about the house.

25. *Dolly.* While in her father's room at the University on June 4, 1904, she said of a skull that it "looked just like dolly." This was evidently from analogy with the heads of several of her dolls as they appeared when the hair had been pulled off.

26. *Mouth.* On June 6, 1904, she pointed to the tip of one of her shoes and, putting her finger into the hole worn through the leather, said "these are mouses" (*i. e.* mouths). She had several times before used the term "mous" for holes and openings of various sorts.

27. *Dandelion.* On June 6, 1904, seeing some white daisies, she called them "white dandelions."

28. *Whiskers.* On June 8, 1904, while handling the brush used to clean milk-bottles, she said, "it 's whickers, like tather's."

29. *Dust.* The same day, just after getting up in the morning, she noticed the heavy mist and said "it 's all dusty."

30. *Crust.* On June 9, 1904, speaking of baked mackerel, she said: "I like the truts" (*i. e.* skin).

31. *Bluebird.* The evening of the same day, on seeing some blue sky after clouds and rain, she said: "It 's blue like the bluebird." She had seen a bluebird (her mother told her the name) the same morning out in the yard.

32. Some time in November, 1903, when she possessed an "animal book," she confused some of the pictures one with another. A donkey she called a rabbit (she had had a toy cloth rabbit as a plaything for some time previous). A lop-eared rabbit she called a dog (probably because its ears resembled those of a cocker-spaniel she was acquainted with).

34. *Pear's soap.* Her early acquaintance with "Pear's soap," caused her to name all soap after it. "Pear toap." In the summer of 1903, while at the seashore she called the foam in the wake of the steamboat, etc., "Pear toap."

III. *Argument and Expostulation.* Under this head may be grouped the following:

1. On the morning of October 8, 1903, she looked out of the window at the rain and said: "Tather hap-a (have to) take umbrella, mama!"

2. The same day she remarked: "When hohn (horn) blows, nen (then) do-ta (go to) dinna." She remembered the dinner-horn in Bayville, Me., where she had been from the middle of July to the middle of September.

3. Again, she had spilled the box of buttons, with which she was playing, all over the floor, so that her mother had to move her chair, so that they could be picked up. R– said: "When Wut pick up zese buttons, nen (then) mama tit down nea (there").

4. In the early part of 1904, she often said, when asked to do something: "I tan't I'se too little," or "Wut tan't, she's too little" (Feb. 20, 1904).

5. On March 26, 1904, after waking up in the morning, she said to herself as she moved about on the bed: "Don't zou tome in our way, horsie! We are tryin' to play out-doors. We are tryin' to play out-doors. Don't zou tome in our way!"

6. On April 7, 1904, after waking up, she said she wanted to "tee puddle by Tommy's barn." It had been raining the night before. She evidently remembered the puddle of water caused by the eaves-droppings of the barn in the back yard, where Tommy, the horse, was kept. This puddle she had noticed several times after a storm. In this case, she may be said to have reasoned from the rain to the puddle on the ground of past experience.

7. On April 9, 1904, she said, "Mama, put my tizzers on my dess like women at a tore." She had noticed the way the clerks at the dry goods stores wore their scissors attached to their dress.

8. The same day she eloquently pleaded with her mama: "Put tome warmness on it [her little toy stove] off zour tove." By this she meant for her mother to put some of the fire in the big cook-stove into her toy one.

9. On April 1 she said of some strawberries that were placed before her that she would "eat trawberries to birds won't det 'em." A short time previously she had said of some article of food that she was going to eat it "to tiger won't det it."

10. On March 7, 1904, she said of a book which she had been "reading:" "I'm des tru wiv it. Zou tan put it back, if zou wants."

11. On December 16, 1903, when her father suggested washing her face, she said: "Ma (mama) wash Wut's tace when mama tomes."

12. On March 9, 1904, when "cooking" on her toy stove she asked: "Tink (do you think) zis will boil up, mama?"

13. A little later, she said, of something she thought her mother was going to fry: "O, you are don-da (going to) put 'em in-a (in the)

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oven." And soon after: "Now, we dot-ta (got to) watsh dises (dishes), mama."

14. On April 16, when her mother was dressing her before breakfast, R—protested vigorously, saying: "Don't dress me, mama. My nightie will do better."

15. In February, 1904, she said often: "I'm not a baby now. I 'm a little dör'l (Feb. 20, 1904)."

16. On October 7, 1903, she said: "Mama tome in udder woom. Don' (don't) tit on dat tool (a piano-stool) all night, mama!"

17. On December 2, 1903, she said of something she was doing: "Won't zat be better, tather?"

IV. *Comparison.* She finds considerable difficulty in the "than" constructions, indeed does not seem to have used them of her own initiative. Of her own device she has developed the use of "neither" instead of "than." Examples: "I like zis better neither zat." On April 17, 1904, while playing "buying," she said that "dreen roses tost more till red ones,"—she uses "till" in its proper sense otherwise. She uses "best," "the best," "best of all," with their proper significations. Also "better" in such ways as "I teel better now." On April 17, 1904, when her mother asked her, as she seemed tired, whether she wanted to have her "nightie" put on or have her supper first, she mastered the comparative situation by saying: "Tan't zou put my nightie on?" She does, however, use expressions like "I mus do zis tirst." In reply to questions such as: "Do you like oat-meal crackers better than graham crackers?" she often says (as on April 18, 1904): "I like oat-meal trackers, *and* oat-meal trackers." Here the repetition seems intended to serve in lieu of the comparative form. The same may be said of other answers to such questions, *e. g.*, "I like oat-meal trackers *all the time*," where the last phrase is the significant one. She uses, of course, "so" in the accepted way, and on April 13, 1904, when her father had hold of her ankle, she said: "Tather, don't hold Wus to tight, hold Wus tlowly (slowly)." On the morning of April 19, 1904, while looking at her coat, which she had not seen for some time, she said: "I thlink zis is the bets (best) pretty little toat neither the ozzer one." On April 21, she said in reference to what had been built with her blocks: "I want a dooder one." On May 19, 1904, she came to her father with her little scissors in her hand and said: "I want to tchow (show) zour tissors by mine. I want zour tissors to tchow if mine are tlean enough." After receiving them she placed them one over the other and said: "But zour tissors are the little points." Her father's scissors were smaller and narrower than hers.

On May 15, 1904, she said of some object she was playing with "that's too big enough." Shortly afterwards, the same day, she remarked, "I am titting tlose by nearer tather," after having moved closer to him on the floor.

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For some time previous to this she had used the expression "warm enough," and the like. Also "very tarefully," "very tlowly," etc. She now uses "like" in the accepted sense (It's like," "it looks like"). On June 15, 1904, she used the expression "that isn't most as big as this."

V. *Definitions.* On June 6, 1904, in answer to the question, "What is—for?" She gave the following (they are numbered in the order received):

1. *School:* All the children do (go) in, an' ladies an' dirls.
2. *Church:* Why the people do in an' ting (sing) an' ting an' ting.
3. *Store:* People do in an' buy tomesin for zeir dinna'.
4. *Book:* Why it's a book to read.
5. *Window:* Why that 's a window to look out.
6. *Clock:* Why it's to wind it up.
7. *Picture:* To look at.
8. *Pen:* It's to write wiz.
9. *Ink:* It's to put on a pen to write wiz.
10. *Paper:* It's to write on when I write on.
11. *Street:* To do out on.
12. *Water:* To trow 'tones in.
13. *Trees:* Wind blows the trees down. They burn the trees down, in the woods.
14. *Flowers:* They are to pell (smell).
15. *Dogs:* Why dogs are to tay bow-wow-wow!
16. *Doors:* To chut the doors.
17. *Knives:* They are to tut.
18. *Forks:* They are to eat wiz.
19. *Cups:* They are to drink out.
20. *Spoons:* They are to eat toffee wiz.
21. *Fire:* Is to burn things up.
22. *Ice:* Ice is told.
23. *Milk:* It's to drink.
24. *Tea:* It's to eat.
25. *Coffee:* It's to drink wiz a 'poon.
26. *Safety-pin:* To pin your dress wiz.
27. *Oranges:* They are to put on the table.
28. *Potatoes:* They are to took (cook).
29. *Lettuce:* They are to put on talad.
30. *Scissors:* They are to tut.
31. *Sewing-machine:* To tew.
32. *Refrigerator:* It's to put thing in.
33. *Plates:* They 're to eat on.
34. *Salt:* It's to put on meat, I duess.
35. *Candy:* It's to eat.
36. *Letter:* It's to put paper in.
37. *Stamp:* To post envelopes.
38. *Lamp:* It's to light.
39. *Stove:* Why it's to warm things on.
40. *Oven:* To put things on.
41. *Mama:* You are the lady.
42. *Father:* He's a man. He's a tather.
43. *Ruth:* I'm a little dirl.
44. *Bath:* To have dollies in to wash.
45. *Nose:* It's to 'teeze (sneeze).
46. *Horse:* To ride in.
47. *Cow:* To milk.

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48. *Mouth:* To eat.
49. *Picnic:* You eat the pickinic before it gets bad.
50. *Smoke:* 'Poke is to tome out of 'poke-tack.
51. *Table:* This is a table to eat.
52. *Chair:* It's to tit on.
53. *Broom:* It's to tweep.
54. *Mirror:* A mirror's to look in.
55. *Eyes:* They are to look at pictures.
56. *Chimney:* It's tor tanta tlaus to do in.
57. *Fly:* To fly around.
58. *Ground:* The ground is drass and dirt to dig.
59. *Rooster:* He's to tay whr-u-whr!
60. *Birds:* They are to ting.
61. *Key:* To lock the door with.
62. *Money:* Is to put in my pocket-book.
63. *Garden:* It's a darden to put radishes on.

On the morning of June 7, 1904, she gave the following:

64. *Piazza:* To do (go) out in our back yard.
65. *Houses:* They are for people to do (go) in.
66. *Lemons:* Why they are to put in a pitcher an' to eat.
67. *Chickens:* They are to do in their own little house.
68. *Butter:* Butter is to put on bread.
69. *Pepper:* Why pepper does (goes) right in your nose.
70. *Umbrella:* To do (dū) around your head this way (making gesture with hand; she then said she would get the umbrella and show how—this she did).
71. *Wheels:* Wheels are to belong to wagons.
72. *Spool:* To put on needles.
73. *Piano:* It's to play on.
74. *Wall paper:* Is to not trats (scratch) it.
75. *Frog:* Trogs are down in the water.
76. *Fence:* A fence is to do (go) around here (making a circle with her finger).
77. *Trunk:* To put thlings in.
78. *Pillow:* I'm not lyin' on any pillow.

On the afternoon and evening of June 7, 1904, the following were obtained:

79. *Hammock:* Why it's to twing.
80. *Hammer:* To put tacks in.
81. *Typewriter:* Why it's to typewrite on.
82. *Snow:* Tow is to draggle in.
83. *Leaves:* Why they are to drow (grow) over.
84. *Beads:* They are to put around your neck.
85. *Carpets:* Why they are to put on the floa'.
86. *Hair:* It's to put on your head.
87. *Hills:* They are to do (go) up an' to walk into Boothbay Harbor.
88. *Stones:* They are to trow in the water.
89. *Soap:* It's to trub (scrub) your hair.
90. *Wagon:* It's to ride in—Tam's wagon.
91. *Towels:* They are to wipe your tace wiz.
92. *Rubbers:* They are to put on your teet an not let 'em be wet
93. *Balls:* They are to bounce.
94. *Balloons:* To' tick (stick) out the window an' let 'em blow.
95. *Babies:* To put in tarriage.
96. *Bicycle:* By'cles are to ride on.
97. *Bumblebees:* They are to do (go) on flowa's.

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98. *Curtains:* They are to put on the window.
99. *Bottles:* They are to put in ginger-ale.
100. *Napkins:* They are to put round your neck.

These "definitions" exhibit a wide range of observation. The number of distinct actions referred to is large. The verbs used in the answers are:

Are, belong, blow, bounce, burn, buy, come, cook, cut, dig, draggle, drink, eat, fly, get, go in, go out, grow, guess, have, is, let, lie, light, lock, look at, look in, look out, milk, pin, play, play or, post, put in, put on, read, ride in, ride on, say, scratch, scrub, sew, shut, sing, sit, smell, sneeze, stick, sweep, swing, throw, typewrite, walk, warm, wash, wind, wipe, write on, write with,—some 60 altogether.

The nouns (words occurring in question and answer not being counted) are:

Backyard, Boothbay Harbor, bread, carriage, children, coffee, dinner, dirt, dollies, door, dress, envelopes, face, feet, floor, flowers, ginger-ale, girl, grass, hair, head, house, lady, man, meat, neck, needles, nose, paper, pen, people, picnic, pictures, pitcher, pocket-book, radishes, salad, Sam, Santa Claus, smoke-stack, something, spoon, stones, table, tacks, things, trees, wagons, water, way, window, woods—52 in all.

Her description of the school is based upon her own observation of a schoolhouse to be seen from her front window. She was taken to church at a children's service consisting chiefly of singing. She goes regularly to the grocery with her father and mother. She is very fond of "reading," "writing," looking at pictures, and was (recently) very anxious to "wind tather's tlock." Throwing stones in the water is one of her delightful out-door experiences. She was early interested in the movement of the leaves of trees in the wind; the second part of No. 13 is accounted for by her having been (recently) taken into the woods. Smelling flowers was lately her chief reaction to them and is largely so now. Her answers concerning fruit, vegetables, and other articles of food and drink show how closely she has observed the preparation and disposal of some of them. Her definition of a cow is based on the experience of a few days' before, when, for the first time, she saw one milked. That of the chimney goes back to the Santa Claus at the dry goods stores at Christmas time. By a curious twist of her speech the "pickinic" is eaten. The answer to No. 62 is accounted for by the fact that, for some time past she has had a little pocket book of her own. That to No. 63, arises from her having "planted" radishes in a little "garden" in the back yard,—the radishes seem to have impressed her more than the other things planted. The process of making lemonade is remembered in No. 66, and personal experience accounts for No. 69. No. 74 reveals parental admonition. No. 82 records her delight in tramping about and "scuffing" the snow with her feet. No. 87 shows her memory of her summer in Maine, as

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does also No. 90. The definition of bumblebees embodies an unsuggested observation of her own the day before.

VI. *Fear.* She shows fear of very few things. She is somewhat afraid of the dark at night, but not in the day-time, and cannot be persuaded to enter a dark room alone at night, although she will allow herself to be shut up in a closet during the day, or will even ask to have this done. When asked why she does not want to go into a dark room she says simply, "it's dark." She is not in the least afraid to go into the dark with her father or her mother, either when taking hold of their hand or not. When one (or both) is in the dark room, she will wander all about it fearlessly. On the evening of November 30, 1903, the first instance of what was possibly a distinct fear of the dark was noticed: Ruth wanted to go out into the back room to put the butter away in the refrigerator. The room was dark. She first peeped cautiously around the door and then said, "Mama, watch Ruth put away butter." When she was through, she ran back into the kitchen, saying, "Tiger will get Ruth." Her mother said, "Where is the tiger?"—"Out in the yard," said Ruth. "There 's no tiger in the yard. Who told you that?" said her mother. Said Ruth, "Ruth told that." Ruth had seen tigers in her animal-books, but has never been told any stories that could stimulate fear of the dark or fear of "tigers." Her mother remembers hearing it said of herself, that, when about a year or more old, she was very much afraid of "a royal Bengal tiger" on the back of one of her picture-books. Ruth never has been afraid of the picture of a tiger, and has always been very fond of cats. She seems very much interested in tigers, and said of her favorite cat, without the resemblance having been pointed out to her by any one, "Mittens looks just like a tiger."

Of animals she is not now and never has been afraid,—particularly cats, dogs, horses, cows, which she has always wanted to "pat," and has generally done so when possible. Even when an infant she was not at all afraid of animals. Nor did she ever show any fear of fur, but stroked and patted the cat and the dog, as well as the fur of muffs, scarfs, aud other articles of dress. When about a year old, she saw a lynx-skin (with the head mounted), used for a rug, and although it was of very ferocious appearance, grew to be fond of it, called it "titty" (kitty), and used to ask for it when it was not to be seen. When she was eleven months old she showed no fear of chattering monkeys, but fed them with cherries. Nor has she been afraid of "feeding" the dog or the cat, or of giving a horse grass, etc., to eat.

While at the dinner table on March 28, 1904, Ruth said "I want to eat this, so a leopard won't det it." Her father asked

her if she was afraid of a leopard, to which she replied no. He then asked her if she had seen a leopard, whereupon she said "no," but continued "I did tee a tiger this months." In answer to the question, where? she replied, "In a tore" (store). When asked what the tiger was doing, she said, "Buying tometin to' his mother." On the evening of the same day at the tea-table the tiger came up again. Her father asked her if she was afraid of a tiger. She answered "no," whereupon her father said, "take father's hand, and let's go find the tiger." She acceded readily enough, and although the sitting-room was not at all well-lighted, crawled up to the sofa and stuck her head under to see if the tiger was there. Then she said she had the tiger in her hand and brought it into the kitchen. Finally she found her mother's bag and put the tiger into that, bringing him again into the kitchen and dining-room.

On the afternoon of April 17, 1904, she saw a short-billed gnat on the sitting-room window, and begged her mother to shoo him away, so that he would n't bite her. About a week before a girl friend of hers who is afraid of spiders and mosquitos was playing with her and this fear (?) of the gnat is to be attributed to that occasion. On May 18, 1904, she watched her father kill a large mosquito. She said, shrugging her shoulders (this she does often when she speaks of being afraid), that she was afraid of mosquitos,—"I am praid of teetos,"—but she does not evince it in any particular way.

On May 14, 1904, she was taken to see, for the first time, a circus parade, and showed no fear whatever of any of the animals (her father held her in his arms in the street as close to the animals as was safe). The elephants and camels, horses and ponies were numerous, and she greatly enjoyed seeing them. The lions and bears were exposed in their cages; she was quite excited over them, but in no way afraid.

On May 21, 1904, she was taken to another circus parade and showed no signs of fear, except that the noise and the steam of the calliope seemed to disturb her somewhat. She was taken close to the cage of tigers but was in no way frightened by them, but showed great interest and laughed at their actions,—opening the mouth, swishing the tail, etc.

At present (June, 1904), the only things she can be said at all to fear are being in the dark alone, and being alone (even in the day-time). When her parents have hidden from, or when she has come into the house with one of them, and the other has hidden, she seems to be frightened and sheds tears, becoming very excited. When she wakes up in the night, she generally does not like to be left alone even for a moment.

VII. *Imagination, etc.* The nature and vividness of her imagination are illustrated by the following:

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1. On March 7, 1904, Ruth played what might be called "find the tiger." She was standing on her mother's bed at its head, soon after waking up, and, while playing with the knobs on the bed-posts, said one was a tiger. Her father then asked, "where is the tiger?" Ruth said, "It's gone down there" (*i. e.*, behind the bed). She then said, "I'm going to look for the tiger." Her father suggested that she look under her own bed. She did so, and then began to look all over the house, in the corners, under the furniture, etc., for the tiger, and finally brought in a bit of pink flannel, which she had found under the bureau. This, she said, was "the tiger's tail." Her father then told her to go find the tiger. She soon returned with a silver spoon, which she said was the "tiger." Soon after she said, "no, it isn't the tiger," and went on the hunt again. In a little while she went out into the kitchen, saying she was going "to buy a tiger," and "a leopard," she soon added. At this point her mother found for her a stuffed cloth cat, and asked her if that was the tiger. She said, however, "that's Ruth's kitty," and afterwards, that it was a tiger and a leopard. Her father then asked her if she wanted to find the tiger and the leopard. He helped her find the pictures of these in the Encyclopedia, which pleased her very much. And so the play ended.

2. When she woke up on the morning of April 10, her father asked her "what are these?" pointing to the ornamental head-pieces of the upright rods of the iron bedstead. "Efful" (elephant) she said of those at the head of the bed, and "tiger," of those at the foot. A few moments afterwards, when asked where R– was, she pointed to one of these things at the head of the bed, and said "Zis Wus," and then, of two others, "Zis mama, and Zis tather." Then her father observed: "But you just said those were elephants. Is Ruth an elephant, and father and mother, are they elephants?" To which she replied: "No. Wus id n't an efful. Zis [pointing to one of the objects in question] id n't an efful *now!* Zis will be an efful." This incident illustrates the ease with which her imagination works and the rapidity of change and metamorphosis. To her these iron head-pieces (clover-shaped) are a source of much satisfaction, as she sometimes stands up on the bed and, handling them in succession (there are 14), names them off as "tather," "mama," "Wus," "efful," etc.

3. On April 30, 1904, when she was out on the back veranda, playing, the following was said:

R. I dave a horsie a piece of my tandy, mama.

Mama. Yes?

R. Wha' do you 'pose he doed to it?

Mama. I don't know.

R.. He blewed at it, to tee what it wuz, zen he ate it.

This was all pure imagination, as she had not fed a horse since sometime last fall, when noticed the "blowing" of the horse as he took the food offered him.

In her play she shows a wide range of imagination and a certain cleverness as well.

VIII. *Nature-Observation, etc.* The notes below may be put under this head. Those concerning the rainbow are, perhaps, of most interest.

1. *Rain.* She is very fond of watching the rain and putting her hands out of the window to feel it and "catch" it. Her favorite expression is "to tats tome rain to take home to my mama." She runs to her mother with her bare arms and hands all covered with rain-drops and "gives" her them. She says that the rain "tomes out the ty" and "does into ze dround" (June 5, 1904). In response to the repeated question "What does the rain do?" she said: "It does into ze dround, tomes out aden, makes it all wet out here, and never tomes out aden."

2. *Clouds.* On June 5, 1904, in answer to the question, "what do the clouds do?" she said "Dey dust duggle in the ty (sky) all the time." The word *duggle* is of her own invention and it's meaning is rather indefinite. She quite early spoke of clouds as smoke.

3. *Rainbow.* On June 5, 1904, she said while watching a rainbow that it "moved." When asked how, she replied "like people walking," and a little while after, "the rainbow is walking this way," illustrating the motion by walking herself. When asked again, a few minutes later, how the rainbow "moved," she said "goes round like a wheel," and added "now it's tipping over." She has seen a number of rainbows and always said that they "moved." She has said several times, with no great emphasis, however, "I'm atraid of rainbow." This is a pretended rather than a real "fear." After saying that "it's a big round rainbow," she asked: "Where's rest of rainbow, mama?" As it disappeared, she exclaimed: "It's most gone. It's covered with up the sky."

4. *Sun.* On the evening of June 5, 1904, to "What does the sun do?" she answered, "Don't you know?" Then, in response to the question, "What is the sun doing now?" she said, "It's *twigglin'* in the ty," and then "it twiggles in the ty." Then, evidently as an afterthought, "twinkles, I mean." She knows the sun is "round" (expressed by gesture) and "red." When asked if she knew anything more about the sun, she repeated, rhythmically

I taw the tun all bright one day,
I taw the tun all bright one day.

It is thus clear she also attaches the idea of brightness to the sun.

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5. *Thunder and lightning*. She does not appear to be at all afraid of thunder and lightning in the day time, and will stand by the window with her father or mother and watch the storm with much interest and talk about it readily enough. On one occasion, in May, 1904, she was awake in the dark during a thunder storm, and seemed frightened at each flash of lightning, crying to be brought where the light was. Otherwise she had not shown distinct fear in the matter. Apparently it was the lightning and not the thunder that affected her. On June 9, 1904, she said, with no accent of fear: "I'm atraid of the tunder 'torm."

Some other items of this class will be found under the rubric: Definitions.

IX. *Obiter dicta*. Some of her "sayings," are as follows:

1. "Zis is a tineture (sinecure)!" Said of something she was doing (March 15, 1904). Evidently caught up from conversation of her elders, like many of the others.
2. "O dear, I wis' the dood old tummer-time would tome!"
3. "I'll bet two tents zat's tather!"
4. "Zis intn't (isn't) a tow (cow), it's an alecdote." She calls a nanny goat an "anecdote" or "alecdote."
5. "My dranpa's dot pants like zose, lovely ones!"
6. "Zat's a charming picture!"
7. "Tan't we have a pickinick, mama?" (March 16, 1904).
8. "Playing with tather on the bed, having a lovely time," (March 7, 1904).
9. "What tan I do with a tather like zou?" (April 16, 1904).
10. "I hav'n't dot no 'tories. Dey is all done (gone) out of my mouth. By-an'-by I will buy tome tish-tories" (April 18, 1904).
11. "Toot (shoot) the rain! (May 19, 1904, looking out of the window)."
12. "Who will take tare of me?" (May 26, 1904,—when alone by herself. Also several times when she heard her father or her mother speak of going away)."
13. "I tan't do that, 'tause I'm too *worky*," (May 28, 1904).
14. "Zere's my hubsand (Feb. 20, 1904). Said while looking at a passer-by out of the window.
15. "I'm doin' to tee Doctor ———. My children are tick." (June 8, 1904.)
16. "What tall I do nex' tummer?" (June 15, 1904).
17. "Do you like New Japan?" (June 16, 1904). Suggested by the "Old Japan" of a nursery.rhyme, with which she is familiar.
18. "I'm doin' out *horsing* now" (May 20, 1904).

Concerning No. 14, it may be added, that about the same time she was heard talking to herself about "when I wuz married."

X. *Poetry and Song*. She has always been fond of lullabies, "Mother Goose" rhymes, limericks and spontaneous effusions of her father. The "singing" by him of "The Assyrian came down," etc., or "Lum-tee-tum-tum was a Chinaman,"—the last original with her father,—is still a powerful soporific.

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On December 24, 1903, was recorded her "first poem," as follows:

Máini, móni
Mákaróni.

On March 11, 1904, while reading out of a book, she spoke thus, as noted by her mother.

Bab chip mam, doxny muxny, won't zou be mine?
Tokny, okny, I will let zou out.
Jumny júminy.
Tosy nipsky umny, quack tay (says) a duck.
Tackny, dackny.
Ama doni, opkny, buckny.
Tobny buckny, omi dosi, hama dosi, won't zou be mine?
I will tasy . . . . chumpsy . . . . . tápeny . . . .
Mockny . . . . docksy, wocksy,
Won't zou be mine?
I will whack zou
Wiz a pine.
Whocksy, won't zou be didesy?
I want-a be dìdesy.
Dickny buckny, I will whack zou wiz a bocksny.
Does zou want-to wear didies?
There wuz an old person of doyden,
Who wanted to boyden.

In this compound of prose and verse can easily be recognized her own inventions mingled with recollections and imitations of many things sung or said to her.

Some time afterward the following fragment (repeated several times) was rescued from her chatter:

Mússy, mússy,
Chúcksy.

On March 31, 1904, she exclaimed: Buttertup tays bàggō an dàggō.

On the evening of April 19, 1904, just before going to bed, she said:

There wuz a little máddibō,
Who lived on a táddibō.

On the morning of April 22, 1904, just after waking up, she had quite a "linguistic interval," from which her parents obtained the following:

1. Asmela, ásmela,
   Tánpūs.
2. Ádje púnda,
   Aìsa múnda,
   Hápal to múnda,
   Horsie, where's e' (the) pála?
   Háspanilábal,
   Whíspani.
   Bolúbadîssa,
   Little bit o' money.
   Dolly and Tally and Tally went out to walk,
   Hásmidála.

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3. Mouses,
   Gooses.
4. Little ducks,
   And many mucks.

Here ought to be recorded also her rhythmic utterance (June 5, 1904):

I taw the tun all bright one day!
I taw the sun all bright one day!

This she "sang" to a sort of tune, as she also does some phrases and sentences, when "playing" on her toy piano.

On the evening of June 17, 1904, while telling a friend about going to Bayville, Me., in the summer, she "sang" repeatedly, with great expression in the way of gestures and playing her "pe-pano."

On the big river boat!
On the big river boat!
ad lib.
You have to ride on the river boat
A long, long time
Till you come to the bridge!

This was delivered in a sort of "chant."

XI. *Righthandedness.* She is distinctly righthanded, using implements, knives, scissors, pencils and like objects as do ordinary adults with the right hand. Her spoon and her fork sometimes with her left hand,—the latter perhaps by imitation. When she "sews," she puts the needle in with her right hand, and then changing the cloth from left hand to right, pulls the needle through with her left. On May 18, 1904, when trying to unbutton her shoes, she used first one hand then the other. In trying to unbutton coats, dresses, etc., she uses either hand sometimes. She "writes" with her right hand only. On May 19, 1904, her mother, at the black-board, wrote a little with her left hand. R., who wanted to write, picked up a piece of chalk and began to "write" with her left hand, but, after making a few marks, she changed to the right, with which she wrote for a long time taking great delight in rubbing out the marks she had made and making more of a similar sort. Her righthandedness began early. On Aug. 23, 1901, her father noted that, as she lay on her back in bed, with one hand across her breast, she stretched the other up alongside her head. This she did with both hands, but oftener with the right. On the afternoon of October 12, 1901 (when she was a little over two months old), her father watched the movements of her hands as she lay on her back in her carriage. Of 58 consecutive movements of the hands 38 were of both hands together, 5 of the right only, 15 of the left only. Of 58 movements of the hands, when both hands were at rest, 29 were right and 29 left. Of 10 movements of the hands while she was asleep 2

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were left, 8 right. At present (May 1904) "right" and "left" seem to be just words to her, of which she is quite fond, using them of other things than hands and feet, ears and eyes. She also employs "right" "left," indiscriminately, of "near" and "far" objects—*e. g.*, "Dive me the right block." Likewise with the sense of "this" and "that." On May 17, *e. g.*, she asked her father if his lower lip was his "left lip." She is utterly unable to accurately distinguish her rights and lefts (side, hand, foot, ear, eye).

In climbing the stairs (May 16) she put the left foot forward.

On October 13, 1901, her mother recorded the following observation: This evening when Baby was being got ready for bed, she was laid in her cot on her face (she had only her shirt on). She lifted her head and shoulders clear of the bed several times, moved her legs in all directions, bending her back into a bow. At last, she succeeded in turning upon her *right* side, and then on to her back.

The next evening the experiment was repeated. Baby again turned on her back by her *right* side. This time she also progressed backwards several inches. She succeeded in drawing up her legs so that she rested on her knees, elbows and chest, almost in the position for creeping.

XII. *Stories.* On December 27, 1903, she said: "Alexander wuz in the toa (store) dettin doose (goose) to (for) mother's little tild (child)." This seems to be R.'s first attempt at story-telling; it occurred during the excitement of Christmas-tide.

On March 4, 1904, R. began spontaneously to tell a story (No. 1 of those below) to her mother, who recorded it. After she had done, her mother asked her to tell another story and she continued until the seven were told, which are here given as written down.

1. Once upon a time there wuz a efful (elephant). A dreat big efful and a little efful. The little efful was climbing on the big efful's tummy (stomach). And they began to ting, Dooley-ooley. And they bedan to drow (grow) a *long-long* trunk out in tront (front).

2. Once upon a time there wuz a titty out in the back zhard. There wuz two titties, a big titty an a little titty. And the little titty wuz climbing on the ozzer one's head. And they bedan to sing, Doy-oy-oy.

3. Once upon a time there was a black tat (cat) trom Bayville. He jumped around all the trees. Dess (guess) he broken a tree.

4. Once upon a time there wuz anuzzer black tat. He lived down to Bayville. I dess he did n't broken a tree.

5. Once upon a time there wuz a black tiger. And he bedan to try cry). And he climbed up in a tree and taid, was n't that a dood tiger? And then he ran home to tind (find) his mama and his tather (father), and Helen. And he tat in a chair, and Helen taid, Who is zat?

6. Once upon a time there was a *leopard!* And a piger. [Here her mother asked, What is a piger?] A piger is a dog. And they bedan to tind their mother in their own home and their tather.

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7. Once upon a time there wuz tcheep (sheep) wight (right) in the middle. And anuzzer tcheep. And they bedan to tick (kick) up their teet an tay tiddlee-dee. There wuz anuzzer black tcheep tat up in a tree an tay tiddle-dee-dee.

On March 15, 1904, Ruth told some more stories, when asked by her father to "tell a story:"

8. There wuz a little dirl wuz digging in the tow (snow). And then she tell (fell) down and she bedan to try. And she dot up and she wan home to her mama and she telled her mama, I broke my leg.

9. There was a little birdie up in a tree. And he bedan to det down, an he dan (began) to look round, and he dan to det up adain.

10. There wuz a little bidzii.—O that is a bad tory. [Then, looking at a book she said, Here's a lovely, awful tory.]

11. There wuz a little Wus (Ruth) who tell wight down in the mud, I mean in the tow (snow).

And her tather picked her up, and her tather drownded her.

12. There wuz a little diddy.—I don't know about the west (rest) of it.

13. There wuz a little rickiness. [When her father said, What is a rickiness, Ruth replied, "a little duck with its mouth open]. And it wuz doin this way with its tingers" [making motions with her fingers].

On March 31, 1904, she told another story:

14. There wuz a little dirl who jumped up and down. Who detted (got) in her pony tart. And her mama took her out. And her mama buyed her a brura (bureau).

On April 30, 1904, the following stories were taken down by her mother.

15. I taw a little dirl, wiz a brown dress on. Her name was Libbus (Elizabeth). She had a dolly wiz a pink dress on.

16. I taw anozzer little dirl. She was Helen. She had two tathers and two mothers. She wuz tsurely a little dirl, she tould (could) walk. There was anozzer little baby dirl who was Helen's little bruzzer.

17. I taw anozzer little dirl. Her name wuz Baby-Baby-Baby Bunting. She had two tathers and two mamas, tive (five) tix (six), whole lot a (of) mamas.

18. I taw a little auntie dirl. She had a baby, too.

19. I taw a little onkle (uncle) dirl. And Onkle tooked her up in his arms.

XIII. *Spontaneous Formation of Words.* A spontaneous outburst of the word-forming instinct occurred on the evening of March 19, 1904. Ruth came into the room where her father was sitting at his table writing and asked for a piece of paper (a waste fragment with scribbling on) which she happened to see. On receiving it she ran into the kitchen and then into the bathroom, where she hid it behind the door on top of the lid of a tall clothes-basket. When she came back she asked her father for "a di aika," meaning a similar piece of paper, which she took and hid in like manner. Without any suggestion she continued the process until 20 pieces of paper had been obtained, named and hidden. Then she began to bring

them back, one at a time, naming them again as she gave them to her father. When asking for them first her formula was "I want a——," and, when returning them, "This is a——." She stopped returning them at No. 16, having become somewhat tired with her exertion in running so fast and so many times from the front room to the bath room and back, and being interested in the presence of a friend who had just come in. The names she gave and the order in which they were given are as follows:

When asked for.	When returned.
1. Dīaíka	Plépla
2. Dii'ka	Pāidjamā'ka
3. Dāmā'sa	Dādā'tā
4. Taigā'kā	Bābā'pā
5. Taiā'sā	Didítā
6. Ákā	Dāgā'kā
7. Issā	Didā'kā
8. Aíssā	Didíkà
9. Trō ō'tsa	Bābä'ka
10. Naika	Didíssa
11. Tree with roses on it	Bä'bībū
12. Taā'ta	Bē'bī bū
13. Pamā'pa	Dägibū'
14. Taā'sa	Dā'dzibī
15. Pókis	Bädzibū'ts
16. Taä'ssa	Dadä'tūn
17. TaĘk	
18. Tizíssa	
19. Piúksa	
20. Jishsha	

Except No. 11 of Col. 1 and Nos. 11 and 12 of Col. 2 (the first of these is a phrase often used by Ruth; the second and third are evidently identical with *baby boo* or *babby boo*, one of the caressive names applied to her by her parents), these words appear to have no marked relationship with the words of the English (or any other) language as used by the child or her parents.

On March 28, 1904, her father tried to get her into the same inventive mood, but she became tired and gave up after three trips. The names given when taking the bits of paper, were:

1. Dū'sinibī'zima. 2. Dédzūdā'bidī'zā. 3. Paiáidi. When returning them: 1. Agigi (and *Abidi*). 2. Abigugígigō'gup. 3. Gū'gibú.

On April 24, 1904, she named several of her play and story "bears" thus:

1. Halibúsded. 2. Apis minóvna. 3. Chabásinúa. 4. Efful (elephant). 5. Chabáda.

When she said "efful," she held up a piece of string and

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said that was his trunk. It is impossible to say whether she really meant to call one of her play-bears "efful" or not,—this may have been one of the "lightning changes" she so often makes.

On May 19, 1904, she named seven of her "effuls" (at the head of the bedstead) as follows:

1. Ekkunt. 2. Tomprint. 3. Tanbrink. 4. Grinfrintee. 5. Hampintee. 6. Pambrintee. 7. Homincómprins.

On May 20, 1904, she named a dozen envelopes, which her mother had been addressing, as follows:

1. Binni nith lid'n dikl' it. 2. Damin dumerlin tum lin tee. 3. Mamlin emlin ginin gonon to bamli to mamlin. 4. Lason tesum em bosin honi flawnis. 5. Bamlin gason a mamem a mis mami hamlin gasin bamli tee. 6. Mamlin tee. 7. Tromblings tamblingings. 8. Kami zamins. 9. Pamblin bamblin tee an drap. 10. Blamlin tinklin ranlin hampusin em blos tail talin goth. 11. Hamlin to wan bloxin trumblig troth. 12. Bail en lawsin bamlin toolin.

At her own request, she was allowed to "name" them again, taking them from the pile in reverse order:

12. An blesin lisdin pus in bamlin gos a. 11. Pussy-cat (apparently from pus in No. 12). 10. Trowni osso man pa pa pa. 9. A bamling hamlin gopli mamin. 8. Hamlin ming cabin. 7. Gee mingi win. 6. Hamgot to mingli hamli simla. 5. Bal borden hablin teekin. 4. No name. 3. Pamla mamla hamlin habbi bee. 2. Bonnin kee ba bee by ya. 1. Dug la.

On May 30, 1904, she named eight pieces of paper as follows:

1. Amling lisfees bis. 2. Badúda tsittafátta. 3. Didáda didada túttа. 4. Heswihégbli. 5. Téetutátsa. 6. Besli hakli goosin. 7. Becksa hesbi doosin dosin. 8. Pastu geslin dawkin.

XIV. *Spontaneous Language.* Related to the phenomena of the previous section, as some of the "words" clearly indicate, is her non-English "language," of which, fortunately, it has been possible to record a number of somewhat lengthy passages of continuous speech. Early in the spring of 1904 she was using a sort of "language" of her own, particularly in answer to questions to which she could formulate no reply in English. She also employed it in talking to herself, to her dolls, and "at" her parents. This "language," her father christened "Chinese," and she adopted the name. Sometimes (as *e. g.*, in May, 1904) she would say: "Now I'm doin' to talk Chinese," "Tather, I want to talk Chinese," etc. By combined tact and patience examples of her "Chinese" at its most flourishing period were obtained.

1. On May 9, 1904, the following was noted:

Lafrinkin pimpringósi papinkiswéesi beri cor colin. Byindinggambin rimpintrig con tim pinbéntrin ucosi téten béntin. Anmi conti cantrik romplin too las minkin pomplin tamplin. Rankin tonkin. Basfrin durdrin. Okin krofree effen tee.

2. On May 20, 1904, she "read" and "talked" out of a

book. From her flow of speech the following were rescued.

Gwalin dothan. Ye yaw manin hawbay. Beli basag hamlin telin hamlin wasin lazing am dawsna raizlin amblásan. Hamlin manin. Hamlin tawsin hanglin bowin to pramlin prackin blallin bomlin herlin baltin an emlin toontin toontin toonténdin. Am amlin amis an do a maslin am blisin amblin to a wuslin a amlin guslin. Bamblin cawsin pamling gisan.

3. On May 25, 1904, she said to her father "I want to talk Chinese," and, pretending to "read" from Fiske's "History of the United States" for schools, delivered herself of a long talk, of which he was able to record the following:

Romlin maswa wasma mamin pamblin doosin preerlam rosin hasin tooli. O madrin noofri tomátlin tindlins. O bafres omlin toofres disin dalrin dalrin toosin. Memli cawsun tosin. Babri batlin toosin toosin pelbrin támidáwsin. Bambin toosin hembin toosin toonding goosin. Amlántin tatrin balin toodrin goodrin avan jaisli. Pamlin deedee tree peerin deezin chai whosin jeesin bopres in tees. Pawsrain cawsin mbrasin wosin. Tambli shamplus. Desden doling dadza dadza. Bafrom hamlin toosin doosin hoosin dawsin. Dewsin bamin primlin toos. Waslin toomin pemlin tomlin tusin.

On May 28, the following was recorded out of a long talk:

Efta chase hordis teesin. Chofjis cheefi jasin an oos an jeis an toosin an dosin gaisin. Dee etsat get an doosin haprin doosin teesin. An deesin dosan drawsin ese om drawsin.

4. On May 29, 1904, the following was recorded:

Ndoosin ges an trostin toos. An reeslin timlin duba an dreesin dressin tootsin toosin. Zeáthris infran dosin doodry. Abbeshéetsis ábbeechìchud borslin treflin betti torsin menta frertin. Beelsrin gesnin tootsin hesin hawsin. A balgin potrésin an droosin heertsin taum an hedin doodin doosin.

5. On May 31, 1904, she spoke the following:

Bissi dochlin doosin bisin too an doosin doo. Whoot doo an doosin beglin an bet an bil. Doos a dulan baytin. Peeplin histrin doos an doosin doo. Tingsbis doos an doos an doolin doo. Ik hespis doos an hecklin doos. Bayspin gayspin ading goosin. Hecklin oos o rogra hecklin dacklin troosan goosin heesin gō an doos. Paypee sweesbin keespi doos. Hay deebnin ooly beesnin deepin haysin goosin hecklin. Bispris says biglin dooshee doosin doos an dumlin. Gée gee gá! Eeswin deelin deesin rossin hecklin. Geelaf geesin doot a prilin heen chleepin heesin hacklin doon hacklin. Hetéesin doosin doolin doobin.

6. Soon after waking on the morning of June 2, 1904, she spoke the following "Chinese," in response from a request of her father:

Déedadávda hecklin toon ebbin treslin gacklin doosin hee. Besbi donin des. E. daisin doonin tecklin. . . . . vo ves zeesin. . . . Amis tecklin doosin dis haslin keeslin. Deglin disin arásin asin whoosin hecklin dool. Vúvusìn hesin doo-ooo. Dees das tada keesin dee ay dasin gaglins. Yow kastlas see sin aveesin tootlin doolin deelin da. Dedáda dadáda áhaháha. Hesam gwasin gwedes an despin desin hudza bee teesin du an dacklin dee. Abása do an denu helin doosin hee an doo. Hadin doo an deesin ges an gledin nusa glesin beegsin doin a turlin dee. Bedi doosin daglin hasin doosin dagin bisin dee an prennin. Takkin veesis budro dasin doosin heglin dasin hees in hee

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do doosin. Bée-ee-réenin abetin seesin heesin beglin doolin heglin heesin. Abélin heelin doosin an beedin doosin deesin too ye deedin doosin me. Masin doosin háy-háy-háy-háy-háy-háy-háy-háy-háy! Teesin a beesin deglin do an daglin doosin dee. Deedaydee besbi sagrom hebéedee daisy daydee babása geesin do an hasin do an dee. Deechin drolin deeni heglin danglin dee heglin doolin daglin heglin blasin. Abráysin gedéedi choosin teen an drolin hoolin hesdin raisgin dailgin blaisin bason heglin deglin droosin koosain doo. Bisin doolin doo.

7. About half-past three the same day she came up to her father and said that she wanted to talk "Chinese," whereupon the following was taken down by him:

Beesin doosin laisin deesin doo. Bedsin teesin doosin dinglin danglin. Thesin doo an wusin deesin dubin. Angàckla cracknin wesin heesin daglin laslin whoosin hecklin woo, Gágagága gágagága gágagága! Abbéesin doosin teesin heglin doosin doolin hesin doo an deelin doosin doo an blacklin kaysin peesin bindef daysin dee. Beeson chisya chisya vuvisda dista. Bixin hatda vingla daglins pecklins mamba. Beela taysin doosin deesin dee doolin deezy. Deesin doo an deesin tee. Gaysin doosin dizin deglins. Adeedzin dee an dillin dee. Baysin wigga. Babba a daysin doo. Deezin deezin doo. Wheezin whoozin wheezin. Deezin doolin dee an hazin heesin heetus deezin beezin dee an dadin deesin doozin tee. Deesin doozin disin dee. Hadni doosin dagnin desin doo. Deesin doglin yeddin gessin deesin deesin haglin deel. Daysin beesin heezin daysin. Geezin deesin baysin doolin. Doosin dosin deesin dillin dee. Peesin dailin doosin heesin doo an daglin. Habáyan doo an dillins. Besin doo an deelin an daglin hesin hee dib beesin deesin dallin doosin too. Besdi avadáda lee. Vis avávlin dee. Deesin deesin daglin doolin heesin deelin daling dee. Dilly dee an dilly hemplin. Besin deedlin heelin baylin doosin teesin dee. Deesin deesin deezin daylin dee. Teesin hyasin heesin ageesin deesin dee. Háytemil hedelin keesin diglin deelin deesin dee. Peesin haylin deesin daylin heesin. Eesin haylin peesin deelin dallin dee. Hedéelin deesin deelin peesin dee. Teesin daylin days heesin dee. Beddin deesin dee.

8. On June 6, 1904, she spoke the following:

Chooliń tootoo leelin doo an heesdoo doosdu heesdoo doolin tee. Beestoo toolin doolin doo. Pubbe ta doosdin doo. Doosto doolin doo dee. Paystoo doolin dō. Vaysdoo doo doolin deelin. Hoosdoo doolin doo. A toolin doolin doosin. Toos doo doolin do toosdoo doolin doosin. Coosdoo doolin dee. Toosdoo doo aylin heesdoo doolin haysdoo heesdo doolin doo. Toosdo deelin doo. Hadóosdoo teestoo deelin. Teestoo haglin doo. Doosdoo too doo dóo doo daylin. Toosdoo doolin deestoo doo.

9. On the morning of June 10, 1904, soon after waking up, she spoke the following:

Dodo geesti goggin tow (tau). . . . Gonggin gonggin taygan. . . . Gogi glesti tsoggin dow (dau), Geegin gonggins heestoo wuggins weeskins wiggins seeskins. Higaygin baykin. Toogin goostoo gooin whoostoo gooin. Teega wheestoo geegin keekoo keelin doogin doo. Whaygeeáysin gaysdoo heesin. Teetoo gaystoo weegin do (dō). O ay iktallin waysin. O woogin hankin doolin dookin dee mit ashlayn day. Fay oo waystoo yay.

10. On June 16, 1904, the following was recorded:

Balin kyap an balin an teecock an balcock. Gwaygin deegin yabin

galin go. Gabing gathring galin. Coóka coóka coóka coóka! Baby baby djevées a baby!

This "Chinese" has an extensive vocabulary, as may be seen from the following list of "words" occurring in the examples given in this article alone:

A, abása, ábbeechìchud, ábbeshéetsis, abélin, abétin, abráysin, ading, ahàha, am, amblàzin, amblin, amis, amlantan, amlin, an, anmi, arásin, ashláyin, asin, avan, avéesin, ay, aylin. Babása, babri, baby, bafres, bafrom, balcock, balgin, balin, baltin, bambin, bamblin, basag, basfrin, basin, batlin, baykin, bayspin, baytin, bedi, bee, beedin, bee-eeréenin, beegsin, beelsnin, beesin, beesnin, beestoo, beglin, beli, beri, besbee, betti, biglin, bil, bisin, bispris, bissi, blaisin, blallin, blasin, blisin, bomlin, booslin, bopres, bowin, budro, byìndingámbin. Cantrik, cawsin, cawsun, chai, chase, cheefi, chleepin, chofjis, choolin, colin, con, conti, cooka, cor. Da, dacklin, dadada, dadza, dagin, daglin, dailgin, daisin, daisy, dalrin, danglin, das, dasin, dawsna, daydee, daylin, dedada, dee, deebnin deechin, déedadávda, deedáydee, deedee, deedin, deegin, deelin, deeni, deepin, dees, deesin, deestoo, deezin, deglin, denu, des, desden, despin, desin, dis, disin, djevées, dō, dochlin, dodo, doin, doling, donin, doo, doodin, doodry, doogin, dookin, dool, doolin, doonin, doo-oo-o, doos, doosdin, doosdoo, dooshee, doosin, doostoo, doot, dootin, dosan, dosin, dothan, dow (dau), drawsin, dreesin, dressin. drolin, droosin, du, duba, dulan, dumlin, durdrin. E, ebbin, ees, effen, efta, emlin, etsat. Fay, frertin. Gabing, gacklin, gaglins, gaisin, gaisli, gathring, gaysdoo, gayspin, gaystoo, gedéedigee, geegin, geelaf, geesin, geesti, ges, gesnin, get, gisan, gledin, glesin, glesti, gō, goggin, gogi, gonggin, goodrin, gooni, goosin, goosti, guslin, gwalin, gwasin, gwaygin, gwedes. Hacklin, hadin, hadóosdoo, haglin, hamlin, hanglin, hankin, hapin, hasin, haslin, hawbay, hawsin, hay, hay-háy-hay, haysdoo, haysin, hebéedee, hechlin, hecklin, hedin, hee, heelin, heen, heertsin, heesdoo, heesin, heestoo, heglin, helin, hembin, herlin, hesam, hesdin, hesin, hespis, heteesin, higāygin, histrin, hoosdoo, hoolin, hoosin, hordis, hudza. Ik, iktallin ininfran. Jasin, jeesin, jeis. Kastlas, keeko, keelin, keesin, keeslin, keespi, koosain, krofree, kyap. Lafrìnkin, las, lazing, leelin. Madrin, manin, masin, maslin, masua, mbrasin, mee, memli, menta, minkin, mit. Ndoosin, noofri, nusa. O, okin, om, omlin, oo, ooly, oos, Pamblin, pamlin, pamling, papìnkiswéese, pawsrain, paypee, paystoo. peeplin, peerin, pelbrin, pìmpringósi, pinbéntrin, pomplin, potresin, prilin, prackin, pramlin, preerlam, prennin, pubbe. Raisgin, raizlin, rankin, reeslin, rimpinting, rogra, romlin, romplin, rosen, rossen. Sagrom, says, seesin, seeskins, shamplus, sweesbin. Ta, tada, takin, tambli, támidáwsin, tamplin, tatrin, taum, tawsin, taygan, tecklin, tee, teecock, teego, teen, tees, teesin, teestoo, teetoo, telin, tétenbéntin, tim, timlin, tindlins, tingsbee, to, tomátlin, tonkin, too, toodrin, toofres, toogin, tooli, toon, toonding, toonténdin, toontin, toosdoo, toos, toosin, tootlin, tootoo, tootsin, tosin, tow, tozin, tree, treflin, treslin, troosan, trostin, tsoggin, turlin. Ucosi. Vaysdoo, veesis, ves, vo, vuvúsin. Wasin, wasma, waysin, waystoo, weeskins, wheestoo, whoosin, whoostoo, whoot, whosin, woggins, woogin, wosin, wuggins, wuslin. Yabin, yaw, yay, ye, yow. Zeáthris, zeesin.

In this list (which does not include many words in No. 7) there are some 430 "words," the extensive repetition not being a bar, evidently, to the appearance of new ones. Concerning this "language" it may be said:

1. It has, in many places, a "primitive" aspect.

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2. It is spoken fluently, with accentuation, word-separation, etc.

3. Monosyllables are rare, rarer even than polysyllables.

4. The characteristic "word" is a dissyllable accented on the first syllable.

5. The great majority of the words have consonantal initials (d, t, b, h, g, leading, in this order).

6. Certain letters, which she does not yet pronounce as initials (*f*, *s*, *k*) appear a few times.

7. In a number of dissyllabic words tri-consonantal groups occur: Basfrin, beelsnin, bispris, cantrik, durdrin, heertsin, infran, kastlas, shamplus, tambli, tindlins.

8. Some words are of a rather curious nature: Ábbeeshéetsis byíndingámbin, déedadávda, iktallin, kastlas, lafrïnkin, pimpringosi, tàmidáwsin, vuvu'sin, zeáthris.

9. There is a marked fondness for a, i, ee, oo, in the body and last syllable of words.

10. A sort of suffix (*-in* and varieties) prevails to a large extent.

11. Certain words are used repeatedly: Daglin, dasin, doolin, etc.

In general this "language," presents a sort of matrix, from which an inflected language could, perhaps, with no great difficulty be shaped. Its exact relation to her own English speech cannot be absolutely determined, but it is safe to say that few of the characteristic "words" of her "Chinese" seem to be derived from or connected with her usual speech-forms. Her English vocabulary (complete count not available) might reach 3,000 words, and was certainly over 2,000 in the middle of her third year.

XV. *Talk.* It has been possible to record some of her "talk" and running conversation on several occasions:

1. On the morning of October 8, 1903, her "talk" before and during breakfast was recorded by her father as follows:

Wut (Ruth) did dive mama nice tmack (kiss). Don (don't) dwess Wut, mama. Wut don wan (want) dat tow-book ("cow-book"). No, at all. Wut did tay mumu (music). Wha' papa, mama? Wut want eful (elephant)—book. Wut did do a wee (minxit). Mama don dwess Wut. Le' (leave) Wut's nightie on. Wut want dat book up the'a, mama. Mama, put Wut on Wut's high tsair. Whe' Wut's bekas (breakfast), mama? Open zat milk bottle over he'a, mama. Mama, Wut tee (see) in the'a. Mama, Wut take a (the) tover off zat one. Let Wut tee in a picka (pitcher), ne'a (there). Bwing a picka over he'a. Wut won't wead zis book, 't all, no! Mama, take Wut up! Wut want tome of does 'tatoes, mama. Tather il hap-a(have to) take an umblella (looking out of the window). Wut put tome of does eggs in ne'a, (there) telf, mama. There tather's egg. Wut did put tome does eggs in ne'a, mama. Wut put tome eggun in ne'a, mama. Wut put tome eggun on tumpin else, mama. Wut tee wat's in nat dis'. Wut take dis to tather. Wuth dive Mittens (the cat) tome of zat. Wut put dat

toup (soup) in ne'a, mama. Tome out of zat way (to the cat). Mama, let Wut tee in ne Delly (jelly), delly, delly. Wut want to trow zat take away out there. Zat tather's milk. Tather, take Wut up. Wut tee tather's eggs. Nothing in ne'a. Bone in ne'a. Wut tee tome o' these eggs. Wut tee tome o' Wut's eggs. Tather, tome to bekas. Tather, take Wuts han'. Wut tarry tome pape's. Wut want bed (bread) in Wut's egg. Wut dive tome of that bed to mama.

The continuation of this "talk" was recorded by her mother, after her father had gone:

Mama want-a put tome-a dat bed in mama's egg, whole lot-a dat bed. What titty dooning (doing) under 'tove, mama? Wut have tome o' dat bed, mama. Tather hap-a (will have to) take umblella, mama (on seeing the rain). Wut want-a bling dites (dishes), mama. Mama hap-a wats (wash) dose dites. Wut want-a tee mama make Wut's dwess and Wut's ap'on, mama. Mama don-a (going to) make Wut's dwess now. Wut want a dwink-a (drink of) wata, mama. Mama, let Wut brut (brush) dose trumbs op-a (off the) table, mama. Wut did tind a tup in mama's woom. When Wut pick up these buttons, nen (then) mama tit down ne'a. That tring is all tangled up, mama. Wut idunt (isn't) chleepy, mamma. He's-a (heres a) tapenpin (safety-pin), mama. Let Wut take Wut's Mawylam chleep, mama. Wut buil' in pools (spools), mama. M'hap-a (mama will have to) buil' 'ose pools, mama. Mimi-mama-motha. Dat little pool tan (stand) up there. Let Wut put 'ose pins in-a (in the) bakun (basket), mama. M' (mama) put tum py-else on ne'a, mama. When ho'n blow, nen do-ta (go to) diuna. Wut want dat book, dat Indin book, mama. Wut did lwead (read) dat book, mama. Wut want an odder book, mama. Wut did tee tee dose pickers (pictures) in he'a, mama. Wave tather's tlag (flag). Wut tawy tome-a dose chlings. Where dat tat (cat), mama? Let Wut tome out he'a, mama. Tut (shut) dis door, mama. M'dott-a (Mama got to) wite den (again), mama. Dit-a (this is the) tover ob dis box. Dat box blongs on he'a. Whe'a's Wut's botty-tap (bossy-calf) and mama-tow? What mama don-ta do? Mama hap-a (have to) hab 'at (that) patton (pattern). Dat's mama's to-a-tine (sewing-machine). Dolly's ha'-is toming op.

2. On the morning of March 9, 1904, her mother recorded consecutively some of Ruth's "talk."

10.00—10.05. Macaroni! I want to bweak macaroni. Put it on my table. I'm bweaking macaroni, mama. Who is zat, mama? Is it the pos-man, mama? What did the pos-man bring? I've dot a pos-man. A tine (fine) big pos-man. What are you witing, mama? Are these papatoes (potatoes) tor my dollies' tea-party? I hu(r)t my hand wiz zese macaronis. Dess (guess) zat's enuff. I'm tookin (cooking). Think this will boil up, mama? Tan't I took (cook) all zis? I thlink (think) zis will be enupf.

10.10—10.13. Tee (see) those are little babies in my toffee-trainer (coffee-strainer). I'm tookin (cooking) little babies. No, I wount n't (would n't) like to be tooked (cooked). Back-door bell wang, mama. I'll tend to it. Are zose new banmanas (bananas), mama? I'm tookin. Where you 'spose my tettle (kettle) is? [Interruption].

10.15—10.20. I have dot a little titser (sister), and Helen and Boynton and Maisie. We are playing and wunning. Now we are tixin (fixing) our dinner. What are zose mama? Are they tossinge (sausage)? Yes, they are tossinges. Are you 'preadin they all out in a wow (row)? Will they try (fry)? O, you are donda (going to) put 'em in a oven. I've dot my Maisie here, Mama. We are donda watsh (wash) dis'es. To-tray, to-tray, to-tray! [Sings]. Now we dotta (got to) watsh dis'es

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mama. We dot suts (such) a lot-a wu(r)k to do, to do, do, do. I dot-a took (cook) my macroni on a 'tove.

3. Following is a brief "talk" to her father on December 2, 1903:

"Won't dat be betta tather? Wut want tamp put on (Ruth wants a stamp to put on this letter). Mama's gone down town, det tumtin nice. Now dat's all right! Dat's a map [looking into a book]. Wut want to tay 'tarewell, mama.' Dat's a nice pillow."

4. Conversation on December 16, 1903, sitting on her father's lap, looking at a "Guide to Long Island," while he was writing at his table.

Zat's where we wuz are [on finding place in book she had lost]. Dit A. F. Tambel (said of a picture that looked like her father). Ta (father) wite 'about dis woad and wite 'about zat woad. Tather wite some mo'a (more) pickas (pictures). Tather wite 'bout all zese. Ta (father) wite zis and zat and zat and zis. What zat plate (place)? Whole lot o' boats zere. Ta (father) don (don't) wite zat aden (again). Map in hea (here)? What dat plathe (place)? Dose are wock. Dese wocks to do rune (in the) water! Ta (father) don wite any moa (more). Dranpa wight zea (there)! Tumbody else. Ma (mama) wash Wut's tace when mama tome back.

Then taking up Hiller and Furness's "Notes of a Trip to the Veddahs of Ceylon," she continued:

Ebel (elephant) an a tow (refers to picture opposite p. 8). Whole lot o' boats and one boat aden (again) (picture opposite p. 8). Indins mans (picture of Veddahs opposite page 3). Island (picture, opposite page 12, of terraced water-fields of rice). Looking at zey knees (picture of dancers, opposite p. 40). What do (those) tunny man doin (picture of Vedda youths with bows). Any moa (more) in hea? Teed (saw) dese. Tader is n't hungry. No.

5. On April 30, 1904, her mother reported the following remarks made by R. while washing dishes for her mama:

Tan I was' zese dis'es, mama? Let me tan (stand) on zis box. Will you please det a (the) drainer, mama dear. Zis water isn't too hot. I tan't hu(r)n me. I am happy to was' zyour dis'es. I like to was' zyour dis'es. I am wery happy now. I'm was'ing zyour new dis'es very taffly (carefully). I thlink zyour new dis'es are wery pretty. They have dot hwflowers on 'em. Are zese roses on zis dis', mama? Did you track (crack) zis dis? O look, mama dear. It broke. Isn't zat *too* bad! Well, never mind. Trow it away. I'm tarrying (carrying) all the dis'es off-a (the) table. Sall (shall) I brus' the table now, mama? I want-a (want to) wipe zis tup. Will zou please dive me a towel, mama dear? Zis don't b'long on-a (the) table. I'm do'nta (going to) make a big pile of zese dises. Don't zou was' em. I'll do it all. I want-a wipe *all* of 'em. Now, make me a little take (cake), white I'm was'in 'em and wipin 'em. It isn't ha(r)d wo(r)k. Will zou please put zis in the chloset? I tan't reach. You wipe the west of a (the) dis'es. You wipe the big dis's, mama, dear.

This "talk" shows the flow of her thought and the ease and rapidity with which she can change from one topic to another. It also indicates the number of different words employed by her in a given amount of speech.

XVI. *Time.* Although she now (April, 1904) uses "to-day,"

"yesterday," "to-morrow," "to-night," "this afternoon," "this morning," "in the morning," "last week," "this week," "next week," "this month," "last month," "next month," "this summer," "next summer," "last summer," etc., it is doubtful if she really has much of an idea of the signification of but a few of these terms. Probably "to-day," "to-morrow," "yesterday," and perhaps "this morning," "this afternoon," and "in the morning" (in the sense of "in the morning when I wake up"), exhaust her time-terms of this sort. Other time-expressions used by her now (April, 1904) are: Now, then, by-and-by, soon, some time, "after I put dolly" to sleep, "before I do out," afterwards, etc. On May 18, 1904, she used the expression "when tummer-day tome" (she has employed it several times before) in the sense "when the summer is here,"—"tummer-day" is a coinage of her own. In the latter part of May she began to use commonly the phrase "once-a-while," in the sense of "once-on-a-time" or "once," *e. g.*, "I taw a blue bird once-a-while" (June 9, 1904). "I had a drink once-a-while." For the future she now uses often "pretty toon," "tome day." Another expression in common use by her is "when I det a big dirl." Also "when I'm drown up," and "when mama is little." She now (June 9, 1904) seems to know Sunday as the day when her father goes to church, and on Saturday (June 11), when her father was changing his clothes she said: "Is tather doin' to turts?" but of its succession in the days of the weeks, she is ignorant.

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PSYCHOLOGY AND PATHOLOGY OF SPEECH-DEVELOPMENT IN THE CHILD.

By EDWARD CONRADI, Fellow in Psychology, Clark University.

The development of language in the child is a subject of great importance to the general psychology of language as well as to child psychology, and it is as difficult as it is important. In this paper it is the aim to bring together, compare, and criticise numerous observations and the interpretations that different workers in the field have made of the language development of the child both normal and abnormal. The following topics will be taken up in the order here given: The Order of Development of the Different Sounds; The Recapitulation Theory; Word Invention; The Child's First Word-meanings; Stammering; Stuttering; Methods of Curing Stuttering.

I. PSYCHOLOGY OF SPEECH-DEVELOPMENT.

1. THE ORDER OF DEVELOPMENT. The vocal language of the child probably begins with the first cry after birth. Crying forcibly expels the air from the lungs, produces deep inhalations as they could not be produced in any other way and thus develops the whole respiratory system. It is even a rudimentary language itself since a skillful nurse can interpret the needs and moods of the child by its cry. It has, moreover, been graphically shown that the muscle innervation of the respiratory system, developed during the early cry period, is the same as that used in ordinary speech (12:193 ff.).

During the early babble period the child plays with its vocal and articulatory organs and makes new sounds for the pleasure they give him; the activity of the speech producing organs is automatic, just as that of the legs and arms is. A great number of sounds are produced which are not found in our language, some of them so complicated that we cannot produce them; among these are the so-called vomitive sounds and the cluck-like sounds, found among some primitive people but not in our own language. Dr. Hall says (15:132), "It would be difficult even with Bell's phonic notation, or with a phonograph, to classify the first vocalizations of an infant." Preyer thinks that all sounds necessary for future language are now produced, whereas Ament thinks the number of possible sounds is infinite, and that it is only with difficulty that the child sinks from this wealth of sounds to the meagre level of his mother tongue

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Gutzmann is still more conservative than Preyer; he says (13:28) the sounds developed during this period are labials and dentals, *i. e.*, the sounds produced in the first and second articulatory systems. Wundt says the tendency to utter such a great variety of sounds has been inherited physiologically through a long series of speech-using ancestors, that soon after birth association tracts begin to develop which make articulation possible, and adds that with sufficient data collected from the early la-la period it might be proved that, due to hereditary causes, the early sounds of children vary somewhat with nationality. As a suggestive illustration he quotes sounds uttered from the 12th to the 14th week as recorded by Preyer and by K. C. Moore. *German:* am, ma, ör, rö, ar, ra, hu, na, om, in, ab, la, ho, mö, nä, na, an, mg, mb, gr, ha, bn, me, nt. *English:* eng, gr-r-r-r, bo-wo, ang, diddle, ing, bow-wow, th, udn, pop-pä-pä-bä, udu, bob-bä, um-go, good, momä (34:289).

The order of development of the different sounds in the child as recorded by different observers shows some general agreement though there are variations in detail. According to Schultze's principle of least effort the vowels ought to develop in the following order: ä, a, u, o, e, i, ö, ü; and the consonants thus: (1) p, b, m, f, w, d, n; (2) l, s; (3) ch, j; (4) sch; (5) r; (6) ng, k, g. Preyer does not agree with this; he says he observed the vowels to appear in this order: u, ä, a, ö, o, ai, ao, i, e, ü, oeu (French) au, oi. He thinks that the sounds do not develop in the same order in all individuals and that the order of development is certainly not due to the influence of heredity (22:240). The consonants he observed in the following order: m, g, r, t, h, b, l, n, k, j, d, p, w, s, z, f, q, x (22:74). He suggests that some of these sounds were undoubtedly uttered sooner but that he failed to observe them.

Sigismund gives the following order (26:138): (1) vowels; a, ä, u, ei, o, i. He says ö, ü, and äu are not spoken purely by children. (2) Consonants; b, m, n, d, s, g, w; f, ch, k are learned with some difficulty, and l, sch, and r, are the last to be spoken correctly. Löbisch gives the following order (11:18): m, b, p, am, ma, ba, pa (but not ab), d, t, l, n, f, s, ch, g, k. Vierordt gives this order during the 3rd and 4th months: mam, ämma, fu, pfu, ess, äng, angka, acha, erra, hab. Preyer did not hear pf and ss so early and doubts whether f can be pronounced distinctly owing to lack of teeth. Gutzmann has heard pf so early but the f was not pronounced as an adult would pronounce it. Tracy examined 700 cases of mispronunciation and on the basis of his investigation arranges the following order of difficulty: b, p, m, h, a, w, o, k, d, q, n, t, f, e, j, s, ch, g, y, sh, v, th, l, r. He found what per cent the number

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of mispronunciations of a letter was of the total number of times the letter was found in the child's vocabulary (31a:89).

Oltuszewski (21:36) has observed the order of the consonants as follows: b, m, p, t, n, d, l, c, dz', ch, k, j, s, z', f, w, g, z, r, t, sz, z, cz. That f, w, l appear much earlier with Preyer's child, he thinks, may be because there are more words in German that begin with those letters, or that they appeared simply temporarily as transitionary noises (Übergangsgeräusche). His observations, he says, contradict Preyer's statement that all sounds used in later language develop so early, but that they confirm the physiological principle of Thausing's natural system of classification. Thausing, namely, holds (31:60) that beginning with *a* all simple sounds are formed by deadening the sound of *a* seven stages in three directions. His system is arranged in the form of an inverted cone as follows: m, b, p, f, w, u, o, A, e, i, j, ch, k, g, y; then from A he drops this series at right angles, l, r, s, ss, t, d, n. The three letters equally distant from A have similar relations to A. Oltuszewski says, if we begin with *a* and narrow the vocal cavity forward we get o, u and all the consonants of Thausing's labial and dental series, but if we narrow the vocal cavity backward we get i, e, and the consonants k, g, ch, j. He then constructs a system similar to Thausing's but leans the dental series obliquely toward the labial series and adds to the former the Polish z-compounds not found in German nor English.

From the above we see that some letters generally appear early and others late; what is the cause of this? Schultze (25:27) explains the order of development by the following law: The sounds appear in a series which proceeds gradually from those which are made with the least to those which require the greatest physiological effort. He adds, however, in a footnote that this series need not necessarily be the same with all peoples and all races, nor even with all families, owing to the influence of heredity. This he offers as an explanation for the fact that Preyer's observations do not verify this law.

Gutzmann supports this law in the main but holds that there are manifold individual variations (12:201). He agrees to Preyer's objection that the degree of physiological effort cannot be measured, but says that the study of stammering children leads one to believe in the law (11:19). He points out that the muscle action in the three articulatory systems, lips, tongue and teeth, and palate increases in difficulty in the order given. And, moreover, that those sounds which are the easiest for the child are most often repeated and are thus fixed in the motor speech memory, therefore they are more readily used when learning to speak (11:22). These difficulties, he says, cannot be measured in a scientific way, but they can be noted in a

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general way by observing the muscle action. In speaking of the difficulty in the third articulatory system, he says: Evidently the muscle sense is less developed in the rear of the mouth than in the fore part. People can readily move their lips and the tip of their tongue into any desired position, but not so with the body of the tongue; and their muscle sense fails completely when they try to move their soft palate without uttering a vocal (13:35). Franke (9:755) thinks the law is valid in the main during the period of voluntary imitation and decidedly valid in the combination of sounds.

Dr. Hall (15:134) says: The child's linguistic development does not proceed from the easy to the hard, according to any adult standard, but the hard and often the very hard, may precede the very easy. Rzesnitzek says Schultze's law cannot be accepted as a fact since by the law of senso-motor association difficult sounds may come early. Some sounds which the child makes playfully give it pleasure and it repeats them. When thus the attention is drawn toward the sounds the intensity of the sensation is increased, and this in turn sets free an increased amount of energy of the motor centres. If Schultze's theory were true, he says, it ought to hold in the instruction of deaf mutes, which it does not since some produce difficult sounds early, and moreover, all pupils would have to make the same progress, which they do not. However, he admits that labials and linguals are physiologically easier and adduces as proof that many primitive people have hardly any other sounds (24:8). Ament also thinks that a categorical statement like that of Schultze is not tenable. He says: The orderly succession of the sounds is for the time being a secret which can only be solved by exact phonetic investigations in the future (2:58). He supports the following principle: The labials and dentals occur oftener than the gutturals among the first sounds of the child because they have a physiological preference. Ma, ba, pa are first because the organs that produce them are active in feeding. Moreover those animals that swallow their food without chewing and thus have a vigorous palate often cry with gutturals. Among birds, for instance, the cock crows "kikeriki," the hen says "gagag" the cuckoo "kuku," the raven "krahkrah." Those animals, on the other hand, that seize their food and chew it before swallowing often use labials in forming their cries. Among mammals, for instance, the dog says "wau wau," the sheep "bäh, mäh," the cow "muh," the cat "miau," etc. (1:55).

Schultze, Preyer, Sigismund, Gutzmann and others ascribe the early appearance of labials and dentals partly to the preparation the child gets through the sucking movements while nursing. Preyer furthermore says: The position of the human

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fœtus is such that long before birth the hands easily may touch the lips, and that the swallowing of the nourishment causes it to flow over the edges of the lips and the tongue thus causing repeated excitement of the nerve endings of those organs. He however holds that the order of succession in which the sounds of speech are produced is different with different individuals, and consequently is not determined by the principle of least effort. It is dependent upon several factors—brain, teeth, size of the tongue, acuteness of hearing, motility etc. Only in the later intentional sound formations and attempts at speaking does that principle come under consideration (22:217). Oltuszewski agrees with the above-named authors as to the importance of the exercise the lips and the tongue get in sucking, and adds that the gutturals and labio-dentals appear so late on account of the complicated mechanism involved in producing them. Sully also thinks that Schultze goes too far with his principle of least effort. He says, the very variability of this order in the case of different children, shows that there is no such simple correspondence as this (29:153).

It has been noticed by many observers that some sounds are made early and later forgotten. From the order in which the letters were learned we see that some sounds uniformly appear later than others. The letter s is used late and has a tendency to remain imperfect often for years. Deaf mutes especially have trouble with it; though they learn it early they must be corrected again and again, whereas r, a very difficult letter to learn, is not forgotten after the deaf mute child has once succeeded in pronouncing it. These facts Rzesnitzek takes as a basis for the following rule (24:28): "The stronger the motor sensations necessary to produce a sound the less danger there is that the sound will be forgotten after it is once learned." This principle, he thinks, explains Treitel's facts which he found in the Kindergartens of Berlin where out of 180 children examined 3-6 years of age, 34.5% lisped.

The law of Schultze has undoubtedly some validity during the period when the child imitates voluntarily but does probably not apply to the early reflex babble period. In early infancy the child makes many muscular movements reflexively which it is not able to co-ordinate for a definite purpose. Even some of the individual movements are late to come under the control of the will. It is one thing to produce a movement accidentally while motor activity runs riot, another thing to produce the same movement voluntarily. The same is true of the early speech sounds; during the early reflex babble period when sounds are produced in profusion many sounds are accidentally uttered which it may be very difficult to produce voluntarily somewhat later. To determine the successive appearance of

the sounds of our language during this early period the child must be observed constantly and every sound recorded otherwise the record is not accurate because a sound or a group of sounds may appear one moment and not recur for some days or even weeks to come. The appearance of the later voluntary speech sounds is more easily recorded, and it is to these that many of the above records probably refer and it is to these that the principle of least effort somewhat applies. Any observations in this line should state definitely in which period they were made. The arguments advanced by the different writers for the preference the child gives to labials and dentals are quite plausible.

2. RECAPITULATION THEORY. Does the child repeat the history of the race? is a question which has interested psychologists and educators for the last quarter of a century. Biology offers numerous facts which suggest that, both in the embryonic stage and in childhood, the ontogenetic parallels the phylogenetic development. These facts produced by biological investigations lead naturally to the question whether there is a similar psychic parallelism. Some of the ablest psychologists, both in this country and abroad, have worked in this field and sought to throw light on this question, the most prominent among them being Pres. Hall of Clark University. To what extent is there parallelism in the development of child language? Let us see how different observers interpret the facts.

Schultze was the first to suggest this parallelism between the language of the child and that of the race, but leaves the solution of the problem to the special investigator in languages (25:41). Steinthal holds that there is no difference between the original creation of language, the learning of language by children and the language in daily use. Language is an ever creative activity and its origin is the same process as that which is taking place in its every-day use; that the language of the adult is different from that of the child and that of primitive man is due to the different view the adult of to-day has (27a:86). Preyer says, in the same way as the oldest language developed will the language of his time develop in every individual. Stricker says (28:68): "It is furthermore probable that human culture has had no special influence on the development of the very first psychic activities of the child. The care of children and sanitary conditions may have improved; but the first glimmerings of speech ideas (das erste Aufleuchten der Sprachvorstellungen) has probably not been materially changed by culture since the time when man had as yet no articulate speech." Again: "I am inclined to believe that the child in the first stages of development of its speech-intellect,

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gives us a picture of a primitive condition of the speech of man. I am inclined to believe that the fact, that the first auditory sense impressions affect the muscles of the head and arm, is a rudiment of gesture language, the only language available to primitive man." And Techmer says there are analogies between the phylo- and the ontogenetic development of language, but also differences due to an inheritance from all our ancestors that were able to speak, an inheritance to which primitive man was not subject (29a:215). Compayré says, the awkwardness in child-language corresponds to analogous phenomena in the history of languages. The child confuses c and t, and l and r; it says "crop" for "trop," "cravailler" for "travailler," similarly the Latin "tremere" has become French "craindre," and according to Egger, he says, the ancient Egyptians did not distinguish between l and r and the Chinese to-day do not pronounce the r (4:248). Sully thinks that in the two original sources of child language, expression of states of feeling, desire, etc., and imitation of natural sounds we have the two commonly assigned origins of human language, and that to that extent there is a parallelism between the early evolution of language in the individual and in that of the race (29:144). Tracy (31a:81), in tabulating the 5,400 words in the vocabularies of 25 children, found that they contained 60% nouns, 20% verbs. Kirkpatrick (17) says the words in the English language contain 60% nouns, and 11% verbs. The ratio of the nouns in the two tables is 60:60 = 1, but the ratio of the verbs is 20:11 = 1.81+. This, Tracy says, supports the view that the acquisition of language in the individual and in the race proceeds by similar stages and along similar lines, basing his view on Max Müller's statement that the early sanskrit roots of the Indo-Germanic languages all represent actions and not objects. Oltuszewski says (21:39) the gradual development of language in the child corresponds in a certain degree to the development of the same in the race. There are three stages of language development in the race which correspond to its mental development: (1) The original stage where each element represents a concept, the Chinese, for instance; (2) The aglutition languages which express a concept by means of circumlocution in which sensuous representations are needed; (3) Inflected languages. The child, he says, at first has only general ideas which it expresses by a word or series of words without any grammatical order, like the Chinese do. The aglutition period we do not find in the child because it lives in an environment of inflected speech, and therefore immediately passes over to the third stage.

Gutzmann says, the parallelism between child language and the language of primitive people needs no further proof (13:29).

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The cause of this parallelism as to sounds he bases on the theory of least effort advanced by Schultze. The sounds produced by the root of the tongue and the rear palate are the latest to be learned by the child and are absent or rare among primitive people—such are k, g, and ng. The k, he says, was introduced only recently among the Samoese, and they made the same substitutions according to Pratt's grammar of the Samoese language, that our children do—they interchange t and k, and n and ng. Moreover, the child during its first sound period (Periode der Urlaute) produces vomitive sounds, made by pressing the base of the tongue against the rear palate, sounds which have become fixed in a large group of culture languages in western Asia, and also the so-called "Schnalzlaute," cluck-like sounds, found among the Hottentots but in no culture language. This parallelism, he says, gives us a clear view into the ontogenetic and phylogenetic development of human speech.

Ament says that the old original "Sprachgeist" is at work when the child learns its mother tongue (2:40). He finds that the most common and most pregnant phenomena of child language also play an important role in the development of human language in general. "The laws of sound in child language have been active in the historical development of our language. In word-formations through invention, through imitation of words of the mother tongue under the influence of elision, insertion, substitution, transposition, metathesis, prolepsis and metalepsis of sounds and syllables, through derivation, composition, contamination, and etymology, the investigator finds nothing but old acquaintances; word formations by analogy give the key to the laws of form in the 'Volkssprachen,' and sentence structure reveals the different degrees of word-sentence, sentence with and without flexion as original states of the isolating and inflecting languages. Moreover, the grammatical as well as the logical development show distinct parallelism." Thus he concludes that the ontogenetic is a brief repetition of the phylogenetic development, but that there are certain deviations (called Cenogenesis by Häckel) which are caused by a shortening of the process and by later influences. In explaining this theory he says, we must assume that the inherited speech mechanism of the child corresponds more to a primitive state of development of the human race than to the state of development of his parents. Therefore the spontaneous word formations are similar to those of primitive people, and his imitated word formations similar to those produced by the race within historic times (1:84). He considers the biogenetic law of language as firmly established as that of embryology (2:42).

Dr. Hall says (15:133): The individual child may epitomize

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in its stages of development the history of the race in speech, as in so many other respects ontogenesis summarizes philogenesis, but we can never know how far this is the case because the race history in this respect can never be written. Franke (9:773) says, Even though the development of language in the race and in the child is quite similar, with only different external objects to excite speech activity, yet we must assume that some sound formations appear comparatively early with the child due to their importance and to a greater inherited speech capacity; and that in primitive man sound development was farther behind psychic development than in the child. Psychically primitive man may have been on the plane of the year-old child, but as to sounds he certainly stood lower.

Wundt says that in the development of sounds in the child there is an approximate repetition of the general development of sounds only up to the point where language really begins. It holds true during the stage of inarticulate cries and the stage of articulate expressions of feeling to which no idea is attached, but not beyond that. Similarities like those pointed out by Gutzmann, between the language of the child and that of the Samoese, he says are not in point, because those people have, it seems, themselves developed considerably, since they formerly, in all probability, had a much fuller system of sounds. Moreover, these sound simplifications as they are found in language development in the race can be explained by certain psycho-physical conditions, and if there are some parallelisms between child language and the language of primitive people it lies in the domain of word and sentence structure, and is explained not by a "biogenetic law" but by the general peculiarities of an undeveloped consciousness (34:296). Ament replies to this that nobody doubts that it is due to an undeveloped consciousness but adds, "Hätten aber die Thatsachen damit einen Namen? Gerwiss nicht" (1:85).

That there is a certain parallelism between the language of the child and that of primitive people no one denies, but to demonstrate whether this is due to a biogentic law or not is a difficult problem, since, as Dr. Hall says, the race history in this respect can never be written. It is not only impossible to produce a complete history of the culture languages, but it is equally impossible to establish the changes that the languages of primitive people have undergone in their development. Ament and Wundt seem to represent the two poles in this discussion, and yet they are not as far apart as one would at first think. It would seem that Ament's construction of the biogenetic law does not differ very much from Wundt's "undeveloped consciousness." And when Ament holds that Wundt explains nothing with his term it devolves upon the former to

set forth clearly which of the two terms is the most luminous. Comparative studies in this field can but be very fruitful for the psychology of language.

3. INVENTION. Does the child in its early language development invent words? A number of observers record words which they consider original with the child. Taine, for example, gives the following: koko = hen, oua-oua = dog, ham = food, tem = give, take; and says originality and invention are so strong in a child that if it learns our language from us we learn its from the child (30:257). In the case of the word *ham* he thinks both sound and sense were invented. Darwin records mum = food (5:293). K. C. Moore: lum = cat, bizz = her own shadow, bahdiz = a figure on the ceiling, alah = a girl often seen; also the following, used once and then forgotten: babax = hinge, blebs = ledge on the piano, piece it = to break. Horatio Hale (14:286 ff.) among other cases reported a case of two twins who began to talk at the usual age but not their mother tongue. They refused to utter a syllable of English though a sister 5 years old tried to make them do so, and hence they could not be sent to school when the time came. He also quotes a case from Dr. E. R. Hun. A girl 2 years old used only the word papa and mamma, but from that time on she began to use a language of her own. Dr. Hun had compiled her vocabulary which consisted of 21 words. These were used in a great variety of acceptations, indicated by the order in which they were arranged, or by compounding them in various ways. Romanes quotes Hale's paper at some length in order to demonstrate some principles of language invention in children. Tracy (31a:71) and Rzesnitzek (24:17) on the testimony of the writers quoted above, believe that the child invents words. Rzesnitzek says, however, whatever efforts a child may make to invent a language it is soon checked in its efforts by being urged to accept the language of its environment. Lindner's boy in the first month of the second year gave a long drawn out m when he heard the noise of a passing wagon. This Lindner suggests may mean, "There comes a wagon" or some such idea, and adds that this is an evidence that the boy has learned that his voice may be used to communicate inner states, though it takes one initiated to understand his expressions (18:24).

More recently Ament thinks that one of the girls he observed invented "adi" = cake. He considers spontaneity a very important element in the child's learning to talk, and says (2:38) the child, not the environment, is the creator of the child's language, onomatopoea being the connecting link between originality and imitation (2:63). Stumpf thinks that in general one cannot deny that within certain limits a child may

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invent speech formations, but not in the early stages of development (27:422). He says his boy, who was very slow in learning to talk, was very independent in forming compounds and gives a number of illustrations of which I shall give a few: "wausch-kap" = messer (Fleisch-kaput), "wausch-hopa" = Gabel (Fleisch aufnehmen), "hotopapn"=Milchwagen (Pferde essen), "lal-bich" = Briefumschlag but "bich-lal" = Briefmarke, etc., (27.432). He thinks that the child in its anxiety to express its ideas may, as early as the second and third year, be led into original language attempts which are riddles rather than explanations to the adult—just as an adult in a foreign land amongst strangers sometimes coins words that only arouse an ignorant wonder in the person addressed. On the whole, however, he agrees with Wundt in his criticism of the "inexplicable word formations" reported by Mrs. K. C. Moore and others, except the paper by Mr. Hale, which, he says, is not quite clear to him and is not free from objections, but he would not, like Wundt, place it *en bloc* in the domain of fable (27:446).

Sully thinks that children if left alone would undoubtedly be able to invent signs, and instead of signs they might use sounds. The child gives certain vocal reactions to certain mental states, when these reactions are recognized by others they tend to become fixed as linguistic signs—such are "mum" and "ham" reported by Darwin and Taine respectively. The cases reported by Hale, he thinks, testify to the originality of the child in the field of linguistics, but adds that the effect of education is absent in none of those cases (29:138-144). Compayré after quoting Rousseau, Maine de Biran, Lemoine, Egger, and Taine, who believe in the child's inventive ability in the domain of language, points out the following three ways in which the expressive spontaneity of the child may manifest itself. (1) The child furnishes the sound or the word, but the parents give meaning to it though it was uttered without any intention. (2) The child invents a word and at the same time gives it a meaning; this is the most curious, the rarest, and also the most disputed case. (3) Very often the parents furnish the words, but the infant who repeats them interprets them in his own manner and uses them with a new signification. Compayré believes in the child's ability to invent as to the first and third case, but thinks it is difficult to demonstrate whether the child can make a complete creation in language (4:234 ff.). To first see the connection between sound and meaning the help of the parents is perhaps necessary, but after the bridge has been once constructed the child may spontaneously attach meaning to sound with more or less originality. Franke (9:758) thinks creation without imitation in the development of child language is very rare and with many children it is not found at all.

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Preyer answers the question thus: "I have shown that the first firm association of an idea with a syllable or with a word-like combination of syllables, takes place exclusively through imitation; but a union of this sort being once established, the child then freely invents new combinations, although to a more limited extent than is commonly assumed. No one brings into the world a genius of such quality that it would be capable of inventing articulate speech. It is difficult enough to comprehend that imitation suffices for a child to learn a language" (22:215). Wundt says, one can readily understand how mothers and nurses come to believe that the child quite early gives its attention toward inventing its language, but that it is surprising that almost all pedagogical and many psychological observers of child language hold the same view (34:273). In referring to the cases reported above he says that it is now impossible to decide what was really original and what was due to environment, but that it is quite clear that many of these words either resemble some words in adult language or have been so common in child language from quite early times that they look very much like borrowed expressions. For example, "koko" resembles "coque," "tem" resembles "tiens," "piece it" resembles "break to pieces;" and "ham" and "mum" may have been acquired from mother or nurse who often imitate the movements of eating before the child when they are about to feed it, and these words require the same movements. He furthermore thinks that words for which we have no immediate explanation should not be accepted unconditionally as invented. His own child, for instance, used "guck" for "chair." This puzzled him till he found that the nurse had placed a cat on a chair and had pointed to it saying "guck" (see). The child had accepted the word as a name for the chair and later for the cat. He found no original word in the two children which he observed. He believes that the child's word formations, probably without exception, come from its environment, and that the reported cases of invented words in the earlier literature should once for all be placed in the domain of fable. Since more definite details are lacking in these cases it is possible that we are dealing with misinterpretations. He says, the child may, however, develop (not invent) some process of making known its ideas and feelings by means of sounds if a ready-made language did not anticipate it. If children were left to themselves and would hear no spoken word from outside it is to be supposed that they would develop, besides their gesture language a natural though probably imperfect speech. This, however, would take place much later and in a different manner from the cases reported (34:286).

Meumann (20) says child language may be formed in six

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different ways: (1) Words are heard incorrectly and hence mispronounced; (2) these mutilated words may be misapplied; (3) they may be used correctly but also extended to other objects; (4) onomatopoetic words may be extended to other objects by association; (5) the children may form new compounds; (6) with their early babblings in connection with parts of words learned they may develop a peculiar mode of expression which they may use for years until their environment forces them to abandon it. Into this class he would place Stumpf's boy and the cases reported by Hale. The above facts, he says, even the opponents of invention do not deny, and offers these explanations: All peculiarities of child language are due to the imperfect development of the child, causing imperfect imitation. Even though some of its onomatopoetic expressions are new it has heard similar designations hundreds of times since it first began to understand speech. The cases reported by Stumpf, Horatio Hale, K. C. Moore and others show only an acquired mode of language, the development of which deviates from that of the adult. He agrees with Wundt that invention is a bad term. Children have an inherited disposition to develop language, but the environment of adults anticipates these factors of inheritance, and in this sense, he agrees with Wundt, that the language development of children is premature. Idelberger also denies that the child has the ability to create words without external influence. His conclusion is based on the observation of several children (16:289).

It is quite evident that no child will invent its mother tongue as Preyer says, nor any perfect language of any kind, yet we cannot deny *a priori* that the child's originality has anything to do with its language development. The scientific experiment to determine the child's originality has not been made and cannot well be made as Sully says. To take a few occasional observations in this field and then theorize about them is unscientific. To arrive at only approximate conclusions in this matter the previous experience of the child should be accurately known, and even then it is difficult to tell which experiences sink deep down into the child's nervous system and which pass by without leaving a noticeable impression. Observing a child a few hours a day is not sufficient; continuous observation is the only basis upon which a reasonably accurate explanation of the child's new words can be given. We need more, and more careful, observations before we can draw conclusions. Such cases as Hale reports cannot be accepted as resting on a rigorous scientific basis, but rather than place them in the domain of fable, they should encourage us to more careful observation in this direction. Two children like Stumpf's boy growing up together might well, one can imagine,

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develop a form of communication which at first sight would seem fabulous. Wundt's criticism of the reported cases of invention is undoubtedly in the right direction, but when he denies originality in the child altogether his conclusions have rather an *a priori* than an inductive basis.

4. WORD-MEANINGS. The development of the word-meaning of the child is a subject beset with great difficulties. It is probably the most difficult problem in the speech development of the child. What meaning does the child attach to the first words it understands and the first words it utters, is a question as interesting as it is hard; that it is not the adults meaning is quite evident. The child manifests an understanding of words at quite an early age. During the first few months, even, the mother's voice may soothe the child when other voices fail. Here are probably the first beginnings of an understanding of the sounds of its environment. Somewhat later the child will react with the eyes or with the head to certain words, as, for example, Lindner's boy did when he looked at the clock at the word *tictac* (20 weeks), or Taine's boy who looked at a certain picture when asked: "Where is grandfather?" What is the explanation of these facts? What goes on in the mind of the child? Simply associations on the animal plane, or are there glimmerings of a higher psychic activity? How about the first words of the child? Are they on the most elementary association plane or do they represent crude concepts?

The schematic representations of the speech centres have been used in illustrating the learning of language by the child. According to these schemes the child develops a word-sound centre and a motor speech centre; the connection of these two leads to meaningless imitations, and the connection of them with a higher ideation centre leads to intelligent imitation, and finally to original speech, etc. These schemes are very helpful as illustrations—especially in the pathology of speech—but when applied to the learning of speech by children their very simplicity tends to lead to superficial assumptions.

Sigismund (26:111) showed his boy a stuffed woodcock and said "bird." The child immediately looked toward an owl in another part of the room. This, Sigismund thinks, and Preyer agrees with him, indicates that the indefinite concept "bird" had arisen. Preyer says that even before the first attempts at speaking a concept-forming combination of memory images regularly takes place (22:11). Oltuszewski thinks that the child forms general concepts even before the development of language, but that many of its generalizations are false. The rudiments of comparison manifest themselves as early as the 4th month, when the child shows fright at seeing a strange person (21:11). Ament says the child begins with a

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kind of root form, called "Urbegriff," which has germs of both of the later categories (individual and general). From this "Urbegriff" it passes to the individual and then to the general concept. Later, however, the child may omit the "Urbegriff" and begin with the individual concept. (2:152). Gutzmann says with normal children the word-sound centre and its connection with concepts shows surprising development even at the end of the first year (11:32). Erdmann holds that during the period when the child learns to understand language it forms abstract, acoustic word-ideas based not only on what is concretely experienced but also on what is typically universal (8:384).

Taine's child applied "cola" (chocolate) to sugar, tart, grape, peach, fig. Taine thinks that that is a case of spontaneous generalization, the common element being pleasant taste, connected with a desire to experience it again. Compayré thinks the child's gross generalizations are due to poverty of language; it is in the position of a man who has but one vessel out of which he must eat all the dishes of his meal. The child is, moreover, apt to seize upon puerile resemblances and superficial associations (4:246). Sully says a child has no clear grasp of what a grammarian calls a noun; neither does a child go through a process of comparing, etc., when he widens the application of his terms; he rather recognizes something like that which he has seen before without troubling to note the difference. In applying the word *star* to candles, gas flames, etc., the same process is at work that led men to apply the word *sun* to centres of other systems (29:161).

Wundt holds that in the first language activity of the child all logical concept-forming processes are absent. The child names only individual objects. If it seems to widen the application of its terms it is not due, he says, to a process of comparison, but rather to the fact that it easily mistakes objects that have only a distant resemblance and that differences of size and distance play hardly any part at all. Moreover, he says, the same word may be accidentally associated with more than one object, as for instance the word *quak* may be associated with the duck or with the water. He admits that these association processes are at the root of all concept-forming processes, but says the latter are entirely absent in early language development (34:284). Baldwin says children call all men *papa* and all food *mik* because they react to sensations and thus form tendencies to definite reaction which stand "ready to go off" on any kind of stimulus which is locally near enough to discharge that way (3:326). Here he sees what he calls a "concept of the first degree." He says the "general" or "abstract" is only "an attitude, an expectation, a motor tendency" (3:330).

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Meumann objects to the views of most of the other writers. He says the only correct method of interpreting child language consists in the observance of the following three principles: (1) Unless there are special reasons to the contrary, the word-meanings and the psycho-physical processes that are active in producing them must be considered as simple as possible. (2) Where the word-meanings are not perfectly clear the general physical and mental development of the child must determine the points of view for interpretation. (3) When at all possible, the child's words must be interpreted by means of later stages of development which can be observed better. That is, a process of getting word-meanings which can be proved to be absent in later stages must be absolutely excluded in earlier stages (20:4).

He holds that the first word-meanings of the child are exclusively of an emotional or a volitional character. Its first words are desire words and feeling words, if they designate objects it is only a secondary matter He objects to the view that the child in the period when it understands language but cannot speak, forms abstract ideas of meaning (Bedeutungsvorstellungen) as Erdmann says. The first utterances of a child we cannot consider primitive enough, they are associations of an elementary kind, without a shadow of logical activity (20:22). That Sigismund's child looked toward the owl when it saw a woodcock was because the perception of the woodcock and the owl were the same. The application of the word "cola" to sugar, cake, grapes, figs, etc., was no conceptual generalization, as Taine would have it, but rather the child uttered a desire word for a definite desire aroused by the sight of those objects (20:36). He thinks the observations are too meagre to permit of an explanation of these processes in the child.

Darwin reported to Romanes the case of a child who named a duck "quak." It later denoted the water, all birds, insects, floating substances, etc., with the same word. Rzesnitzek (24:18) explains this as an extension of the meaning of a word. Meumann (20:44) says it is simply a case of simultaneous association—the apparent generalization exists only in the mind of the adult.

Specially difficult Meumann considers the following cases: Tracy's boy (31a:75) applied the word "do" (door) to everything that stopped up an opening or prevented an exit including the cork of a bottle, and the little table that fastened him in his high chair. Also the case reported to him by Professor Bovet of a child who used "mü" for taking off and putting on a lid, for the taking away and disappearance of things, etc. And also the case of Preyer's boy who used "atta" to

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designate the disappearance of a person, the darkening of a lamp by means of a shade, the opening and closing of a door, the dropping of an object from the table, and the disappearance of objects in general. Tracy and Preyer would say that the child had formed a concept though it may not have a clear connotation; Meumann says the child has focused its attention upon some common parts to the exclusion of others. If there are no other common factors there may be a common emotional effect that produces the same name. He says schematic plans according to which the word-meanings of the child must develop (Ament's for instance) are easily made, but they tell us only what we already know *a priori* after thinking about the subject (20:55). Idellerger in the main agrees with Meumann's criticisms and conclusions (16).

That the child goes through a concept-forming process during its early language development, as Preyer and others suggest, is incredible. The child-mind does not follow the laws of thought of the well trained logician. Neither can Meumann's view that we must consider the psycho-physical processes of a child as simple as possible, be accepted to apply beyond the very first stages of language. It is always a valuable principle to be used as a check in interpretation, but beyond the earliest language period it should not be used as an absolute law. The child's extension of the application of names may occur in several ways, as has been suggested; it may be due to simple association, or to the child's focusing on some common characteristic which to the child is the whole object; it may be due to similar reactions set off by similar impressions or similar emotional effects, or due, as Sully suggests, to a general vague impression that two objects are alike—a process which we often find among adults when they, for instance, call every vehicle a wagon. Whatever interpretation is given to the facts should be based on most careful observations. Meumann's criticisms and interpretation, in the main, seem to be sound.

When Wundt says the first word-meanings of the child are elementary association processes, which lie at the root of concept-forming processes, and Ament says they are "Urbegriffe," which may later develop into individual and then into general concepts, one is at a loss to see the difference between the two which Ament seems to find (1:68). He does not want to discard the word "Begriff" in naming these elementary processes for fear, it seems, that the genetic principle is done violence thereby, but that fear is based on imagination rather than on fact.

II. Pathology of Speech Development.

Stammering. That the child often imitates sounds incorrectly has been observed by every one who has given attention to the matter. He omits letters, substitutes one for another and even drops whole syllables. Different explanations have been given for this defect. Paul thinks this may be caused by the nurses who reduce difficult words to make them easy for the child, or the child may simplify difficult sound combinations by omitting individual sounds, or by assimilation.—Schultze says (25:37 ff.) his observations lead him to formulate the following law: For every sound, vowel or consonant, that the child cannot produce it substitutes the one nearest related and produced with less physiological difficulty, and if it has not mastered the latter it omits it altogether. The following is Schultze's table of consonants:

Labials	p b	m	f (v) w	r (labial)
Linguals	t d	n	l s sch	r (lingual)
Gutturals	k g	ng	ch j	r (guttural)

Vertically the difficulty increases throughout from labials to gutturals; horizontally, with labials and dentals it increases from left to right, with gutturals from right to left, if we omit guttural r.

Vierordt agrees with Schultze's main theory (33:456). He says the child does not give its main attention to bringing the vocal organs into position, but rather to the sound it is going to imitate. In speaking, the position of the lips, the tongue, the soft palate, does not enter clearly into the consciousness of the child—just as is the case with adults who detect a slip of the tongue not through the motor sense but through the ear.

Wundt ascribes a certain validity to Schultze's principle that the child substitutes labials and dentals for gutturals and palatals, *i. e.*, that the point of occlusion moves from the rear forward. He, however, does not believe that the child substitutes because the sounds are either difficult or unknown since even in the beginnings of imitating speech-movements it generally has control of all articulations. The two reasons why the child makes these changes are (1) the acoustic and the optic apperception of the sounds and the sound-movements are imperfect; (2) the sound-combinations which occur in a continuous discourse are difficult. These combinations (Contactwirkungen) lead to regressive and progressive assimilations of which the latter is much more common than the former. The predominance of progressive assimilation is noteworthy, he says, because in the culture languages of indogermanic and semitic origin the reverse is true, whereas in

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other languages, the altai-ural, for instance, progressive assimilation prevails as with the child (34:298 ff.).

Sully (29:152 ff.), in speaking of omissions, substitutions, and insertions assumes that the child is unable to produce certain sounds and that this defect is not due to a want of discrimination of sounds by the ear, but suggests that an explanation is rather a complex matter. "We must remember further," he says, "that it is one thing to carry out an articulatory movement as a child of nine months carries it out, impulsively, through some congenitally arranged mode of exciting the proper motor centre, another thing to carry it out volitionally, *i. e.*, in order to produce a desired result." As to transformation of sounds, or metathesis, he says, "the explanation seems to be that the right group of sounds may present itself to the speaker's consciousness without any apprehension of their temporal order," and adds, that perhaps quasi-esthetic preferences play a part here too. He suggests that these defects have an analogy to defective speech in adults, in so far as when a man is very tired he is subject to similar inversions of order, and concludes that the student of the early stages of language growth, might find many interesting parallels in these developmental changes in children's articulations.

Oltuszewski (21:33 ff.) thinks that physiological stammering is due to a lack of practice in the proper use of the articulatory organs and to the weakness of the auditory centre. The whole word must, namely, be held in memory until all of it is spoken, and in addition to this the articulatory expiration mechanism must be operated. These difficulties generally pass away in a short time, but if the child's speech is neglected, or if it has poor models to imitate or if its word memory weakens, they may remain and may become what in the pathology of speech is called "Stammeln." Ssikorski thinks that in the child we find two types of mind, one gives attention to the sounds and neglects the syllables and the other gives attention to the syllables and neglects the sounds, both of which may lead to stammering. Rzesnitzek thinks that if the child has not repeated a sound often it has no motor images. If such a sound occurs in a word to be imitated, the child either omits it or replaces it by some other sound since hearing alone is not sufficient to master it; thus stammering begins. The frequency of lisping he ascribes to the fact that "s" is produced with hardly any motor and pressure sensations.

Ament (1:59) objects to the word Stammeln as applied to the language of little children since it is a pathologic term. He uses the word *Wortumgestaltungen* by which he means any change that the words of the mother tongue undergo in the mouth of the child. He says these changes have an undenia-

ble similarity with the slips of the tongue in speaking and reading observable in adults (2:65). He classes them under grammatical rubrics such as elision, insertion, substitution, transposition, metathesis, etc. He offers these explanations but does not consider them exhaustive: (1) Careless pronunciation by adults is carefully copied by the child. (2) That part of the word upon which the attention is fixed is held in memory and is reproduced. A prominent cause of metalepsis is the tendency of the vocal organs easily to resume a position they just have had in the same word, especially if the required positions would be difficult. (3) The insufficient development of the organs of hearing. (4) The incomplete development of the speech organs. He agrees with Wundt that the child may be able to produce all sounds individually but may not be able to make the changes in the vocal organs as quickly as is required to produce every individual sound in a sound group, and with Sully that it may be able to combine sounds according to its own choice, which it may not be able to combine into words. That the child substitutes t and d for k and g during the imitation period he says is not because he never has been able to pronounce those sounds, but because he has forgotten them since his early babble period (1.51).

It is quite natural for the child to have imperfect articulation. Most of the studies in language development of the child confine themselves to the first three years of child life, but the child's language does not develop fully in three years; a large per cent. of the children when they enter school have yet imperfect vocal speech. And even though the child has more or less perfect articulation its oral language is usually not absolutely established till about the time of puberty. That is, should deafness set in before puberty there is always danger that oral speech will disappear also. Kussmaul (67a:259) says with deaf mutes the origin of the trouble can most often be traced to the first four years of life, less often to the years from 4-10, and only rarely to the years from 10-14. Later deafness may injure oral speech but it cannot destroy the word-pictures entirely. We find similar conditions with regard to other brain functions. As early as 1838 Dr. G. Heermann concluded on the basis of an inductive study, that those who lose their sight before the age of 5-7 do not, in adult life, dream in visual terms. He also held that deafness before that time would carry with it mutism. Jastrow (65) found the same result as to visual dreams. If blindness sets in before 5, he says, the visual centre degenerates, if it sets in after 7 the sight-centre maintains its function.

Treitel (87:578) says, the fact that so many who have speech defects can trace the trouble back to their earliest childhood

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and can generally not assign a particular cause for their origin, points rather *a priori* to the conclusion that many of these disturbances have their origin in the development of the child's language. That lisping is so common among children in kindergartens, he thinks, is due to poor perception since s has the highest pitch of all letters (5,400-10,800 vibrations per second). Even adults hard of hearing omit it and it is the letter most poorly transmitted by the telephone. The sounds that are omitted in earlier years he thinks later become stumbling blocks for stuttering. It is furthermore true that children hard of hearing do not distinctly differentiate related sounds, which often leads them to stammer.

It is evident that in the speech development of the child are numerous anomalies of articulation which can as yet hardly be called speech defects, but rather incompleteness of language, as Preyer calls them, yet out of such anomalies there may develop a number of speech disturbances in later years. Gutzmann thinks that stammering in adults can often be traced to bad training in early childhood. He says one may safely say "bowow" for dog and "hühü" for horse in the earliest language period, without endangering later speech development, but during the sentence period of its language development the child should have good models to imitate (55a:52). It is undoubtedly true that if the child fails to learn a given sound in early childhood, the difficulty to master it increases with years. We all know how difficult it is for an adult to learn the correct pronunciation of a foreign language, and the sounds of the mother tongue which the child does not learn will be like the sounds of a foreign tongue to him later on.

Stammering, though it may be quite normal with the child, is always a defect when found in the adult. As a defect it may have one of two causes: it may be either functional or organic. In functional stammering the articulation remains in an arrested state of development without any ascertainable organic causes. Liebmann says in most cases where the defect is functional the child learned to talk late. Organic stammering is due to anatomic anomalies. There may be abnormalities in the lips, the teeth, the tongue, the jaws, the soft and the hard palates, the nasal and pharyngeal cavities, the larynx, the ear or any part of the auditory mechanism which renders the perception of sound indistinct. Stammering beyond the age of 5 or 6 is to be considered abnormal.

Anomalies of the tongue are rare. In most cases where they occur they are caused by the removal of foreign growths, though in rare cases the frenum may be short or the tongue may be too thick. The hare lip does not play as large a rôle in stammering as it did formerly since most children undergo

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operations to correct this anomaly in early infancy. But if the operation is not successfully made the lip often varies from the normal so much that articulation is interfered with. Anomalies of the teeth are much more common. If the upper incisors are absent d and t, if the lower, s and ss are imperfect. If any of the side teeth are absent there may be a lateral escape of breath when the s is articulated. If the incisors are too long the labials are often formed with the aid of the upper incisors instead of the upper lip. Similar difficulties may arise when one or the other jaw is too long. Defects of the hard and the soft palates and of the nasal cavities are very common sources of defective speech.

Stammering is sometimes divided into the following divisions: *Rhinolalia aperta*—when the nasal cavity cannot be closed from the vocal cavity and all sounds are nasalized. It is caused by a cleft palate, syphilitic or tubercular ulcerations in the palate, obstructions to the movements of the soft palate, such as paralysis of the soft palate, or through disease or tumors which interfere with the movements of this organ. *Rhinolalia clausa*—when the nasal passages are closed so that no air can pass through and the resonance chambers of the nose cannot be used. *Sigmatism* when the difficulty is only with the s and sh sounds; *Lambdacism* when the l, *Rhotacism* when the r, and *Gammacism* when the gutturals, especially g, are mispronounced. *Parasigmatism*, *Paralambdacism*, *Pararhotacism*, and *Paragammacism* generally mean the inability to speak the respective letters and others are substituted.

Berkhan (41) has found that stammering children often show similar defects in writing. In the written word or sentence the mistakes are similar to those in the spoken one. For example (oral), "Der vol hat ness" (Der vogel hat nest), (written) "Der Folet ei ness." In the case of half idiots he found no such similarity, the oral mistakes did not coincide with the written. Mielecke (77:104) says there is a difference between oral and written stammering, though in the main they are similar. The oral stammerer's mistakes are constant, he misses the same sounds and sound-combinations at all times, whereas the script stammerer shows no constancy in his errors, the sound-combinations which he writes correctly at one time he misses at another. Neumann says (79:II, 6) stutterers and stammerers often either omit or write in a trembling hand the letters which give them difficulty in oral speech.

Therapeutics. First of all the organic abnormalities must be remedied by surgical operations as far as possible and necessary. Even cleft palates can be operated so skillfully now, it seems, that obturators need be resorted to very rarely. The paralyzed soft palate must be restored; some use massage

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and electricity. The above remedies belong to the physician and preferably to the specialist. Moreover, the pupil should study carefully the physiology of the alphabet. The physiology of each sound that is defective should be demonstrated and explained to him. This can be done by a specially trained teacher. If the pupil cannot place his articulatory organs, not even with the aid of a mirror, they should, as far as possible, be placed in position for him. Stammering is absolutely curable if not caused by incurable mental and physical defects.

Analogous Defects. Meringer and Meyer (76) made many observations as to the lapses of normal, healthy adults, and found that r and l present special difficulties. This has its analogue in people that are mentally diseased, as they point out, but it also has its analogue in children who are learning to talk. It is well known that r words are much used to detect speech disturbances, and that r is a difficult letter for the child to learn. Bawden (39:32) says that the consonantal digraphs which the child learns last and which, according to Liebmann (69:25), are the most difficult to the mentally defective child, are the most involved in the phenomena of lapses, *e. g.*, sp, fl, bl, br, st, sm, qu, etc. Meringer and Meyer's classification of lapses corresponds with Ament's classification of children's speech defects. They think that nearly all our speech defects have their origin in the connecting activity (anreihenden Thätigkeit) of our intellect. Meringer says: "All sounds of the inner language are not of equal value. In uttering a sound those of equal value which one intends to speak are anticipated, and those of equal value which one has just spoken reverberate (though somewhat weaker) so that these sounds may displace the one that was intended to be uttered." Bawden (39:12) thinks that there is a similarity between lapses and functional aphasia—that both are due to a temporary exhaustion through an over-expenditure of nerve force.

Strümpell (85:444) has found similar slips in the school work of children. He says, in a school reader the following series of words were found: Dorf Dörfer, dürftig, bedürftig, Würfel, würfeln, werfen, Ort, etc. It took the weakest boy in the class three minutes before he could say the word *Ort*, due to the influence of the f in the preceding words. Basing his view on Lay's investigations (68a:133) he thinks that in such lapses a motor cause must be considered; that the explanation of many defects in oral speech can be found in the intensity of the motor elements. The individual tries to keep the flow of the movement, whatever is not easily said or written is suppressed or changed so that difficulties are avoided, according to the principle of least physiological effort.

Bürgerstein (45) found similar slips in children's calcula-

tions. He concludes that the most common source of error was that an oft recurring figure in the fore part of a problem pressed itself into consciousness in a later part of the same problem. For example, in the problem: 459208**3**976x6= 7**46**2503856 the oft recurring 5 evidently led the child to figure 5x9 instead of 6x9. Or in the problem: 892415x4 = 37**54**460 the 6 in the product evidently led the child to use 6 as a multiplier. In the addition problem ..6214+..8493 =..**68**7 the 7 in the result probably replaced the 9 in the second column. He also found that figures of similar forms were apt to be interchanged, 9 and 0, 3 and 8 for instance. These slips are similar to the lapses in writing and speaking and it is probably beyond question that many mistakes made by children in their school work are as much beyond their control as lapses are beyond the control of the adult. Strümpell goes so far as to say that these slight disturbances may be the signs or forerunners of serious, even pathologic conditions.

STUTTERING. Speech defects are probably as old as language itself, and as far back as we have any record of them they have been a subject of annoyance. For a discussion of the earlier literature on stuttering one is referred to the works of Ssikorski, Schulthess, Gutzmann and others; in this paper the attention will be focused mainly on what has been done within the last 15-20 years.

Theories. As to the symptoms of stuttering there is a general consensus of opinion amongst the different authors, but as to the explanation of some of these symptoms some authors vary somewhat widely. Berkhan, Coën, Gutzmann, Ssikorski, Oltuszewski, Treitel believe rather that the inco-ordinated movements are involuntary, whereas Denhard, Heymann, Gruenbaum lean to the opposite view, and Liebmann stands midway between the two. Again, Denhardt makes the real root of the trouble psychic, and Treitel and Heymann prefer the same view, whereas Gutzmann lays very little stress on the psychic element, and Berkhan, Coën, Gruenbaum, Oltuszewski and Ssikorski more or less agree with him. Liebmann does not agree to the extreme view of Denhardt who ascribes the chief trouble to the psyche, nor to the view of Gutzmann who thinks that the psychic phenomena are rather results and not causes of the trouble and are usually absent in childhood, but says the psychic factors are found with all stutterers, even with very young ones.

Kussmaul (67a) calls stuttering a spasmodic co-ordination neurosis which hinders the pronunciation of syllables in the beginning or in the middle of the sentence by spasmodic contractions at the point of occlusion when uttering consonants and vocals. There are three groups of muscle action in speak-

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ing—expiratory, vocalizing, and articulatory—and in stuttering the regulating mechanism in the nerve centres which must harmonize these three actions is brought into disorder by peripheral and more often by central excitation processes. Gutzmann and Ssikorski would agree with this in the main, but the former holds that the stutterer may have difficulty with individual letters as well as with syllables, and the latter that mere intention to speak may cause the cramps to set in.

Denhardt (51) says stuttering is the inability under certain abnormal psychical conditions to utter speech sounds either individually as consonants or as vowels or in their combination into words, without repetition and without halting caused by too little or too much force, even though the sound or the word-picture is clearly and plainly before the mental eye of the stutterer. The real root of the disease is in the person's imagination or in his fear that he cannot utter certain sounds. The inco-ordinated movements mentioned by Kussmaul, he thinks, are voluntary.

Wyllie (92) says stammering (stuttering) is due to a lack of co-ordination of the action of the larynx which produces vocal speech, and the oral mechanism which modifies the sounds of the larynx in tone and timbre. In a great majority of cases, he says, the common defect of stammering (stuttering) is due to a delayed action of the laryngeal mechanism.

Liebmann (70) thinks that the primary source of the trouble is in the exaggeration of the consonant elements of the language, including the explosive sound of the vocal cords that precedes the utterance of a vowel—the *spiritus lenis* of the Greeks. At first there are only slight involuntary inco-ordinated speech movements, which through the exaggeration of the consonants cause an interruption in the continuity of speech; but through fright and embarrassment they become considerably intensified. The stutterer will even add voluntary accessory movements which make his speech still worse. He thinks Gutzmann lays not enough and Denhardt too much stress on the psychic element.

Gruenbaum (54) thinks stuttering is a speech disturbance caused by a kind of paralysis in the speech centre. The spasmodic contractions of the articulatory muscles as well as those that are not used in the formation of speech are largely voluntary and only to a small degree reflexive. All psychic peculiarities such as a feeling of fear, doubting one's ability to speak, weakness of will, etc., he, like Gutzmann, says are only natural resulting phenomena. He considers functional speechlessness and stuttering as different degrees of one and the same disease.

Chervin holds aloof from theories, and prefers, in the present

state of the science, to hold to the "terrain solide" of clinical observation.

Stammering and *Stuttering* were long considered one and the same thing, but now they are understood to be two entirely different defects. Schulthess, in 1830, was the first to point out definitely the difference though it had been suggested before that time. In this country the meaning of the two words is not carefully differentiated; stammering is used as a general term for defective speech, including stuttering, though Dr. Hunt, in England, as early as 1863, pointed out the difference, agreeing in the main with the German authorities. Gutzmann states the difference clearly when he says that the characteristic of stuttering is spasms in one or all of the three groups of speech-muscles, which interrupt the flow of speech, but that these spasms may be accompanied by other accessory movements; and that stammering is a defect of pronunciation. The stammerer speaks fluently but mispronounces certain letters—he says, "Appe" for "Affe," "Taffee" for "Kaffee," etc.

Though the two are entirely different defects they may, however, be related. There are complications of stammering and stuttering where the former is the primary evil which causes the latter. If the stammering is cured the stuttering will pass away at the same time. The difficulty, moreover, which the child meets in expressing certain sounds may give rise to the fear of speech, or fear of uttering certain sounds, so characteristic of stuttering. Treitel, furthermore, thinks that stuttering may lead to stammering. He cites the case of a young man 22 years of age who sometimes stuttered two minutes before he could utter a word. Difficult sounds were often replaced by others as follows: Fuhrmacher for Uhrmacher, Fanna for Anna, sachen for lachen, Futsche for Kutsche, Same for Name. These substitutions, he says, were a result of stuttering, and is the only case in literature where stuttering caused stammering (86).

Abulia is another functional disbturbance that should be distinguished from stuttering. It is a weakness of will; the patient may know what he wishes to say and may be thoroughly willing to say it but cannot—his will fails to act. It differs from stuttering in that there are not only no inco-ordinated speech movements, but there are no articulatory movements at all.

Aphthongia has some symptoms that make it seem similar to stuttering. It is a spasmodic contraction of the muscles in the hypoglossis region, which sets in at every attempt to speak and makes speech impossible. It is a very rare disease, only a few cases being recorded in literature.

Blustering, or over-hurried speaking, though it may have

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some similarity with stuttering, is a different disturbance. Lapses are very common with the blusterer. He swallows syllables and words and often gets into such confusion that total inhibition sets in. He may often repeat syllables in his haste but no spasms of the speech organs are present. His speech is never very intelligible whereas the stutterer speaks normal between his inhibitory spasms. The blusterer may prevent his inhibitions by speaking slowly, the stutterer not. Now and then it may happen that stuttering develops out of blustering, but such cases are rare. Moreover, the two defects may occur together, then the patient instead of talking normally between his stuttering spells over-hurries himself so that his speech is hardly if at all intelligible.

Stuttering has some similarity with *chorea* or St. Vitus Dance, but there is always this characteristic difference, as Liebmann points out: stuttering with its accessory movements occurs only while the individual is speaking, whereas in chorea the muscular disturbance may occur at any time.

Etiology. The causes that bring about stuttering may be divided into the more remote or predisposing causes, and the more immediate causes, such as disease, fright, shock, etc. The former are the more important but most difficult to prove.

That inheritance is a predisposing factor is not denied, but some authors consider it much more important than others. Gutzmann (59:302), for instance, says inheritance can only be accepted as a cause when we are certain that psychical infection, *i. e.*, imitation in the family, can be excluded, though he admits (12:212) that in the case children imitate the stuttering of the parents there is probably an inherited weakness (Minderwerthigkeit) because some children of the same family will imitate and others not. He cites a case (11:179) where the teacher had one stutterer among 60 pupils at the beginning of the year and five at the end. He thinks that the parents often wrongly accuse the school as the origin of their children's stuttering, but admits that probably 50% of those accusations are true. He tabulated 300 cases in his polyclinic and found that in 114 cases stuttering had been in the family, but that in no case inheritance could be proved; the stuttering grew up with the speech development of the child. Baginsky agrees with Gutzmann in laying main stress on imitation. He thinks stutterers should be excluded from school until cured or, at least, considerably improved. Chervin says inheritance is an undeniable factor, but that imitation plays a very great rôle in the cause of stuttering. Liebmann agrees with the majority of authors that the real cause of stuttering is nervousness which is either inherited or acquired through severe injuries to the nervous system, such as disease, trauma, alcoholism either of

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the patient himself or of his parents, masturbation, etc. These last named factors, he says, often play only a secondary rôle in so far as they produce stuttering in connection with an hereditary predisposition. Stuttering, he says, can, however, only be considered inherited when the patient has never heard any other member of the family stutter (70:3).

Arndt (36:76) thinks that stuttering, like convulsibility in general, is mainly inherited. He does not think that imitation plays an important rôle since some children in a family where the parents stutter are not afflicted with the trouble, and some that do stutter get well without special treatment, whereas others do not get well, though nothing is left undone to help them. Denhardt, like Arndt, lays chief stress on inheritance. Of 1,994 cases he found that 77½% had inherited their stuttering. When we consider that Coën at one time found in only 26½% and at another in only 11% inheritance and that Berkhan found inheritance in only 18.7% of 209 cases, Denhardt's percentage seems rather high. He, however, considers all cases inheritance where the recent ancestors stuttered, without making any allowance for psychic contagion. He says (51:93), if children imitated the stuttering of their parents they would stutter in the same way as the parents, just as children copy the peculiar dialects of their parents. He has, however, found no such similarity. His high percentage of inheritance, he says, is in harmony with the facts as they are found in the case of other psychical diseases. Gruenbaum agrees with Denhardt, and says if there is stuttering or if there are other nervous diseases in the family we may speak of an inherited disposition.

Of 114 cases in his journal Ssikorski (84:218) found inheritance in 73% of them. He says predisposing inheritance has four symptoms: 1. stuttering in the family; 2. nervous diseases in the family; 3. physical signs of degeneration; 4. special peculiarities of character—such as bashfulness, impressionability, etc.,—characteristics which often manifest themselves in early childhood. He does not think that these peculiarities are a result of stuttering, since those who stutter as a result of fright exclusively are entirely free from them.

Mygind's investigations (78) show, as he points out, that inheritance plays a rôle in stuttering, yet he admits that psychic contagion often enters in as a factor, since children very readily imitate peculiarities of speech; 13% of his 200 cases were reported to have acquired their trouble by associating with stutterers, 42% had relatives that stuttered to the number of 124, 62 of which were brothers and sisters and 31 fathers of patients. Of the fathers 11 had stuttered only in childhood. Idiocy was not found among the relatives more

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often than usual. 32 cases, 16% (in two instances there were two from one family), had relatives to the number of 36 who suffered or had suffered with epilepsy or similar convulsions, and 22 cases, 11% (including two of the above 32), had lost a brother or sister through some form of convulsion, all of which would indicate that there is some kind of connection between convulsions in childhood and stuttering. 58 cases, 29%, had relatives suffering with nervousness, neurasthenia, hysteria, sick headache, etc., to the number of 73, 46 of whom were mothers of patients. 15 cases, 7%, had relatives suffering with asthma, 7 of which were fathers of patients. In 5% of the cases alcoholism was in the family, in 7 cases it was the father who drank. In 10% intelligence was below normal, though idiots were excluded from the courses. 2.6% of the fathers were mentally deranged, whereas the normal for people of their age (20-40) is 0.2%. Of 162 who were examined on this point 11% wrote mirror script with the left hand. Though he admits that he has known many stutterers who had no neuropathic stigma and in whose families there was no nervous trouble, yet from the facts as he found them he classes stuttering among the neuropathic degenerations. His reasons he summarizes as follows: 1. Neuropathic diseases are frequent among the relatives of stutterers. 2. Stutterers have some neuropathic stigma. 3. Stuttering, like most neuropathic diseases, (a) confines itself somewhat to one sex and to certain age periods; (b) its immediate causes are less important than the more remote ones; (c) it is a functional disturbance of the nervous system though its pathologic—anatomic basis is not known.

Oltuszewski also uses inheritance in the wider sense, and classes here all cases (1) where father and mother and the nearest relatives stutter; (2) where there were no other causes besides nervous diseases in the family, such as insanity, neurasthenia, hysteria or any form of nervous degeneration; (3) where, notwithstanding other causes, heredity could be proven. In the nature of predisposing elements he considers inheritance and age as the most important causes (cf. his age table on p. 359). From 1894-1899 he gives a careful record of 535 stutterers who attended his polyclinic. Among them he found 229 cases of inheritance and 30 cases of imitation, and in 169 cases the cause was unknown. Imitation and fright, he thinks, are mostly important factors in connection with inheritance only, for stuttering he says, is a functional neurosis like hysteria, neurasthenia, etc. (80:1894, pp 71).

The more immediate causes that may produce stuttering are infectious diseases, shock, trauma, fear, etc. A blow on the head may sometimes produce a temporary speechlessness which

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gives way to stuttering. Agonizing fright is known to cause stuttering. Disturbances in the digestive organs, interference with the blood supply to the brain, adenoid growths, or anything that disturbs the rather easily affected nervous equilibrium of the child are favorable conditions for the disturbance to set in. Prolonged costiveness is a very common complaint among stutterers and generally aggravates the speech disturbance.

Ssikorski thinks that fright is the most dangerous of the immediate causes. Out of a total of 167 cases he found 40 due to immediate causes, and of these 27, 67.5% were caused by fright, and of another 102 cases due to immediate causes reported by the physicians of military schools, 71.57% were caused by fright. Trauma, he found the next most important. Oltuszewski's table of immediate causes is as follows: Too rapid speech 18, brain disease 2, Imitation 30, Fright 23, Infectious disease 10, Constitutional disease 6, Injury 47, out of a total of 535.

Of Mygind's 200 cases 29% were brought about by the more immediate causes. His tables of infectious disease is as follows: Measles 6, pneumonia 3, scarlet 4, whooping cough 2, diphtheria 2, mumps 1, cerebro-spinal fever 1. Only 2% were caused by trauma. 41 of Gutzmann's 300 cases were caused by disease as follows: Diphtheria 18, measles 14, scarlet 5, influenza 3, typhus 1 (11:183).

That obstructions in the nasal passages affect respiration and speech is quite well known, but to what extent they may bring about speech defects is a question on which opinions differ. It is quite evident that they may produce stammering, but some authorities would say that they are of little importance in the etiology of stuttering. Gutzmann believes that they are predisposing conditions. In 33% of the patients he has met in his extensive practice he has found adenoid growths of a high degree (59:226). Liebmann thinks they may be influential in connection with other causes to bring about stuttering. Dr. Bresgen thinks that at the bottom of most speech-defects there is a diseased condition of the nasal passages, since most of them begin in early childhood. The swellings in the nasal passages produce "speech-laziness" (44:209). They do not only offer resistance to the sound waves which are to pass through but they render less easy the movements of many muscles that are called into activity for phonation and articulation (43:99). These difficulties, he says, lead the child to call other muscles into requisition. By doing this continually the child finally not only calls these muscles into activity but throws them into a spasmodic condition. This muscular activity naturally means a faulty activity in the nerve centres and

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nerve tracts, and brings about a morbid condition of the speech centres in the brain. Thus, he holds, the faulty movements of respiration and articulation which lie at the root of stuttering are in their turn caused by a morbid condition of the nasal passages.

Mygind found adenoid growths in 39% of his 200 cases, whereas another Danish observer found only 18% among the school children he examined. Kafemann and Winckler found among stutterers a higher percentage of adenoid growths than among children in general and think they should be remedied in order to facilitate the cure of speech defects. Gutzmann (57) has in a few cases found temporary relapses in stuttering upon artificial closing of the nasal passages, and Kafemann (67) has demonstrated experimentally that the ability to do mental work is lessened when the nose is clogged and increases when the nasal passage is opened. To what extent these obstructions have a causal connection with stuttering may be difficult to determine, but it is evident that they are a disturbing factor even in normal speech and should receive careful consideration at the hands of a specialist in case of speech disturbances. In some instances speech defects, even stuttering, have disappeared by a simple removal of these growths and in other instances the cure was considerably expedited. Moreover, these growths are detrimental to the mental and physical growth of the child and should be cured whether they cause stuttering or not.

Masturbation is held by a number of writers to be a factor in stuttering. They found that vice with a surprisingly large number of stutterers, and say that it probably contributed to the origin of the trouble, especially since it is well known that this vice, when practiced in childhood, may severely injure the nervous system. Scrofula and rickets are considered by some as important etiological factors; they weaken the system of the child and thus make the conditions favorable for stuttering to set in.

Age. In most cases this disease takes its beginning in early childhood, very often so far back that no definite data can be obtained as to the first sign. Parents often do not recognize the first symptoms and the patient's memory does not reach back far enough to give reliable information. Denhardt (51:101) gives the age of beginning with 348 patients who attended his institute during several years. Stuttering had begun with 250 cases before school age and during school age (to the 14th year) with 94 cases. From statistics he gathered from some of the large cities of Germany he had data as to the time of beginning in 6,206 cases. 87.14% stuttered when they entered school and 12.86% began during school age. Of

the latter nearly ⅓ began during the first school year and ⅔ during the first three years; after the third year there is a rapid decrease to the 8th school year when he finds only 3 cases.

Hartwell's tables (60:8 8ff.), as to the percentage distribution of stutterers of each sex in the several school years, shows a marked increase in the primary school over the kindergarten. He also found that slight stuttering is most frequent at from 7-10 and severe stuttering at from 11-14. His figures also show that stuttering and specific intensity of life have some relation; that stuttering increases markedly in the year in which the body's tide of exuberant vitality begins to ebb, this is especially true of the increase of stuttering at 13-14 and 15-16.

Ssikorski says (84:188) stuttering is a chronic neurosis which generally appears during childhood, remains stubbornly during youth, but gradually wanes in later years; few mature men stutter, old men hardly ever. He took the census of stutterers in a number of schools with a sum total of over 22,000 pupils. His table shows that stuttering holds tenaciously during early adolescence, but recedes with increasing years. He also has a second table containing the record of 406 cases of which he had definite data as to the beginning of the trouble. This table shows that during the second, third, and fourth years of life the tendency to acquire stuttering is greatest. During these years the trouble began with more than half of the 406 cases, but this tendency decreases after five. A tendency toward a natural cure, however, sets in much later, as the first table mentioned shows. The danger to acquire stuttering after 14, according to his table, seems to be very small; almost nine-tenths of the 406 cases acquired stuttering before 10. His highest per cents are at the ages of 13 and 15.

Mygind found with his 200 cases the following data as to the age when stuttering begins: 33 cases began at the age of two, 20 at three, 31 at four, 29 at five, 25 at six, 15 at seven, 19 at eight, 17 after eight, and in 11 cases the age could not be ascertained. We see that 42% stuttered at the age of four. He says the great majority of cases that began to stutter during the third and fourth years were late in learning to talk. About 50% of the 200 cases began to talk after the second year and about 25% after the third year. Mygind does not think that late speech development and stuttering have a causal relation, but rather that they are phenomena of a common cause.

As to age when stuttering began Oltuszewski gives the following data of his 535 cases: Unknown 16, since early childhood 138, 7 at two, 50 at three, 67 at four, 64 at five, 47 at six, 32 at seven, 39 at eight, 16 at nine, 24 at ten, 6 at eleven,

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6 at twelve, 7 at thirteen, 2 at fourteen, 4 at fifteen, 1 at sixteen, 1 at seventeen, 2 at eighteen, 2 at nineteen, 2 at twenty-one, 1 at twenty-four, and 1 at forty-three. Of the 123 stutterers who attended Gutzmann's polyclinic in 1898 and 1899, 62% had acquired their trouble before the 5th year and 28% acquired it during the three years from 5-7. Chervin says stuttering usually begins between the ages of 3 and 7, and very rarely later than 10 or 12 (48a:146).

All authors agree that stuttering usually begins in early childhood, and that many predisposing elements are found in the speech development of the child. The child has not yet firmly fixed all the muscular co-ordinations necessary to produce speech and hence they may easily be influenced by physical indispositions and psychical disturbances such as fear, embarrassment, etc. Liebmann (72:6) says this is especially true of children that learn to speak late. Gutzmann says (11:176 ff.) through the awkwardness of the speech musculature the child often halts in its speaking and this halting may, by increasing, develop into an evil. The child's thoughts run ahead of its motor speech ability and it repeats the initial sound or syllable. Thus, little by little, stuttering roots itself in the speech of the child. Liebmann (72:6) would agree to this, but would add that with some children the development of formal language is somewhat retarded; they think slowly and express their thoughts only with difficulty. They hesitate and correct their speech and thus produce inco-ordinated speech movements which, by increasing in intensity, eventually develop into stuttering.

Ssikorski (84:189) says precipitate speech is more often followed by stuttering than slow speech. He also holds that late speech development is apt to be followed by stuttering. He cites a case, one of his patients, a physician: he had not spoken up to his sixth year when his parents placed him in an institution for the deaf and dumb. Here he soon learned to speak but stuttered. Another patient who had spoken since his second year, suddenly became dumb at 3; at the end of 6 mos. his speech returned but he stuttered.

Some authors consider second dentition and puberty two periods specially favorable to the development of stuttering. Kussmaul (67a:232) says stuttering may appear temporarily during second dentition or at the time of puberty, or it may increase during those periods if already present. Gutzmann would agree to this but would not say that stuttering beginning at this period is necessarily temporary. It is well known that puberty is a period of great psychical activity and therefore not surprising that it has a connection with stuttering. It is a matter of common observation that this disease increases at

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this period. A. Gutzmann says it sometimes appears at this period like lightning out of a clear sky.

Mygind thinks that very early childhood, second dentition, and adolescence are periods when the child is specially subject to stuttering. Denhardt, on the other hand, thinks that second dentition has not as much influence as some think it has. He thinks that the absence of the upper incisors may cause those cases of stuttering which begin during this period. Baginsky (37:II,351) gives the ages when children are especially subject to stuttering as 7-8 and 12-14. Hartwell's statistics (60:87) indicate that the trouble is particularly frequent during second dentition and at puberty. The percentage of stutterers for the different ages was carefully worked out with 9,312 school children in Wiesbaden and 7,000 in Görlitz. Gutzmann (59:335) takes the curves thus obtained and compares them with the curves obtained from Hartwell's figures. The three curves show a remarkable similarity; they rise at 7-8, fall after 9 and again rise at the age of 12-14. When one considers that the first rise corresponds with the last period of rapid brain growth, and the second with puberty it seems evident that there is a causal connection between these phenomena. We also see that these curves are similar to the curves of growth in body weight and height.

Though stuttering may retard a pupil in his school work, the theory that stutterers are mentally weak has not been proved. Denhardt says that statesmen, poets and artists are found among the stutterers, and in many of his cases a comparison with individuals of the same rank with normal speech would often have proved favorable to the stutterer. Neither are all stutterers physically deficient even though heredity plays a very great rôle. A number of writers, for instance, found among their patients men of excellent physique. Kafemann, however, replies to this that some of these men may not have been so robust in early childhood.

Some stutterers pay little attention to the impression their defect makes upon their environment, whereas, many of them are silent rather than expose themselves to ridicule. If they are sensitive they feel their disadvantage and the mockery to which they are subject so keenly that the joys of life have but little meaning to them; they retire into themselves, starve their ambitions, feel suspicious of their environment, and, though living in the midst of society, they starve for the want of it.

Sex. All statistics on stuttering show that there is a great sex difference, there being many more male than female stutterers. Denhardt, Ssikorski and Hartwell give the ratio as about 3:1, Baginsky 2:1. Gutzmann 2:1 for children but 9:1 for adults and says with girls it is more apt to disappear than

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with boys. Chervin gives the ratio as 10:1, but says in lisping the sex ratio is inversed (48a:149,277). Berkhan says the differences are the same as with idiots, half-idiots and deaf mutes. Westergaard found the ratio to be 2.5:1.9, and Lindberg about 3:1 amongst school children in Denmark, von Sarbo about 3:1 in villages and in the country, and about 2:1 in towns and cities among school children in Hungary. My own investigations give the ratio about 3:1 for stuttering and about 2:1 for stammering.

That this difference exists has been observed by all, at least modern writers, but the cause of this difference, an interesting and important question, has not been solved. Some of the early writers thought that the girls had their errors corrected by their mothers because they were in the house more, whereas boys played on the streets and were not subject to this correction and they, moreover, had their speech spoiled by Latin and Greek in the school. Others believed, with Rousseau, that since it was woman's sphere to please by dancing and singing and conversation she had a better developed nervous system and had more fluent speech. Kussmaul, and others after him, think this difference is connected with the fact that women are in general more graceful in their movements and can move in society and converse fluently earlier than men. Ssikorski (84:208-9) thinks that according to his investigations this difference has an hereditary explanation. He examined several ten thousand manuscripts of pupils and found that atactic handwriting occurred with boys 7-8 times as often as with girls. He furthermore found that among 2,492 boys and 5,640 girls the percentage of left-handedness was twice as great among the boys as among the girls. These facts seem to show that there is a better hereditarily developed motor centre in the left hemisphere, since the oral speech centre and the motor centre for the right hand are located near together in this hemisphere. Only on such hereditary basis, he says, can we explain the fact that girls are less subject to stuttering at the age of 2-4.

The fact that girls usually learn to talk earlier, as has been noted by many observers, seems to support the view that there is an inherited difference. Gutzmann gives the following explanations: In its earliest speech development the girl uses its speech mechanism rather automatically without calling the ideation centre into play, whereas the boy is more apt to attach an idea to what he says, even though it be false. Furthermore, in childhood, male and female breathe in almost the same manner; after puberty, however, the abdominal type is more prominent with the male and the costal type with the female[1]

[1] This question is not settled, cf. Havelock Ellis, "Man and Woman," pp. 202-210.

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Of the costal type we are more conscious and hence it is more directly under the control of the will, and since disturbances of breathing are an important factor in stuttering the connection can be readily seen (59:324). Waldeyer (88), moreover, points out that though the entire musculature of woman is inferior to that of man, the tongue alone is an exception. It is not comparatively but absolutely stronger than that of man. Even though this organ is not as essential in the formation of speech as it was formerly supposed to be, the importance of a mobile tongue for fluent speech cannot be denied. Liebmann explains the sex difference simply by the fact that man's muscles are stronger than woman's, but that woman's muscle is more dexterous and graceful (70:4). Chervin says that at the age when stuttering begins girls' language and speech-mechanism is better developed, and that girls lead a calmer life than boys and thus avoid many accidents that lead to stuttering (48a:149).

Hysterical Stuttering. A special form of stuttering which appears in connection with hysteria and hysterical mutism is called hysterical stuttering. Charcot, who was the first to draw attention to hysterical mutism, was also the first to observe that this disturbance is sometimes accompanied by a form of stuttering. He at first believed that hysterical stuttering was a kind of transition-stage from mutism to normal speech; later, however, he found that it may precede hysterical mutism and may pass over into mutism any moment. Ballet and Tissier (38), in 1890, believed that hysterical stuttering may appear as a symptom of hysteria independent of hysterical mutism, though they admit that it may be preceded by a short period of aphasia which may be easily overlooked. They believe that the chief cause lies in a disturbance of respiration. Pitres, in the same year, held that speech defects in many young people who are seemingly not neuropathic may be looked upon as symptoms of a latent hysteria. Chervin (48) objects to this view of Pitres, and also to the term hysterical stuttering, and insists on calling such speech defects simply complications of hysteria. Gutzmann considers Chervin's protest against the term hysterical stuttering useless since it cannot destroy the facts.

Ballet and Tissier think the cause is peripheral; Charcot, the great master of the study of hysteria, Greidenberg, and Higier consider it a cortical disturbance. Mendel thinks it is caused by changes in the sub-cortical centres or in the connecting fibres (Leitungswegen), and Remak considers it an inhibition (Intentionshemmung).

Periodic Stuttering. It has been observed that stuttering often varies in intensity. Nasal catarrh or any other acute

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disturbance of the respiratory tract may increase the intensity considerably. Severe stutterers speak often quite normal during acute diseases, but the disturbance returns as the disease passes away. With some patients the disturbance is most intense in the spring and in the fall. Second dentition and puberty are periods when stuttering is more intense. With girls the intensity often increases during the menstrual flow, and some cases are on record where girls stutter during the menstrual period though they speak quite normal at other times. Cases are also on record where early stuttering recedes to such an extent that it occurs only during short periods in the spring and in the fall—periods when in younger years it probably was most severe.

Simulation. The question of simulating stuttering is of importance in such countries where all able-bodied men must serve in the army and where the stutterer is released from service since he cannot repeat his instructions promptly. A number of earlier writers discuss this question and many devices for the detection of simulation have been suggested, such as, starving the individual into telling the truth, narcotising him with alcohol or chloroform on the supposition that with the stimulant the stuttering would disappear in the stupified condition whereas with the real stutterer it would increase. Other modern and more humane methods are, taking the testimony of witnesses, examining the individual directly, or surprising him so that he forgets himself. This last named method sometimes leads to very ludicrous exposures (59 and 70).

Distribution. Chervin made a careful study of the military statistics of several countries of Europe and found these results: In France 7.5 per thousand were exempt from service on account of stuttering, in Switzerland 3.23. in England 2.87, in Austro-Hungary 2.2, in Belgium 2.1, in Italy .86, in Russia .19 per thousand (48a). Ssikorski's Russian military statistics give a little over 1 per thousand, and among 835,389 recruits examined during the civil war in the United States 1.25 per thousand were exempted on account of stuttering. Ssikorski thinks that this difference may be due to linguistic and ethnographic differences. Chervin, on the other hand, says that even neighboring departments in France show great differences, and that long and difficult study have not given him the key to the mystery (48a:95). Gutzmann, taking the French statistics for the provinces which in 1871 became German, and the Russian statistics of the Baltic provinces, both of which had a considerable German population, he estimates that in Germany there would be 2 stutterers per thousand recruits. Official figures, he says, are not accessible. He agrees with the elder Chervin that climatic conditions are di-

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rectly connected with the frequency of stuttering among different races. Von Sarbo found in Hungary that the Hungarians represent 78.19% of the school population but furnished only 64% of the children with defective speech.

Westergaard (89) took the statistics of 34,000 Danish school children and found 2.2% with speech defects but only .61% stuttered. He found that girls lisped as frequently as boys and nasalized more frequently. He also took the average age of all the children in the different grades and of the children with the different speech defects—each speech defect separately, and found that the average age in every case was higher with children that had speech defects. Lindberg (73) found in Denmark, outside of Copenhagen, among 212,000 children in the country .9% stutterers and .74% among 85,000 children in the towns. Von Sarbo found 1.02% stutterers among 231,468 children in 53 towns and cities in Hungary. He found that lisping was more frequent among the girls. 37% of the stutterers, he says, were hindered in their progress in school. Statistics taken in Hamburg in 1896 also indicate that stuttering retards intellectual development.

I gathered statistics[1] of 87,440 school children in this country, 44,754 boys and 42,686 girls, from the following cities: Milwaukee 31,810, Cleveland 19,678, Louisville 14,865, Albany 11,369, Springfield, Mass., 5,902, and Kansas City 3,816. Of these 2.46% had speech defects; .87% stuttered, and 1.59% had other defects of speech. 1.25% of all the boys stuttered and .47% of the girls, making the ratio nearly 3:1. 2.01% of all the boys stammered and 1.15% of the girls, making the ratio nearly 2:1. Of the four cities which are represented by over 10,000 children each, the percentage is as follows: Cleveland—stutter .5%, stammer .77%; Albany—stutter .66%, stammer 1.35%; Milwaukee—stutter 1%, stammer 1.25%; Louisville—stutter 1.08%, stammer 2.41%.

The cases were distributed by age and grade as follows:

Age	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Stutt.	5	45	101	89	80	84	90	84	82	49	28	13	7	6	4
Stamm.	41	193	221	181	148	144	121	132	86	67	31	9			

Grade	1	2	3	4	5	6	7	8	9	1	2	3	4
Stutt.	142	128	111	119	86	69	53	28	4	12	3	11	3
Stamm.	480	250	156	189	122	71	59	44	4	8	2		

We see that the tendency toward a natural cure is more manifest in stammering than in stuttering, a fact also noted by

[1]For assistance in gathering these data I am indebted to the following city superintendents: T. M. Balliet, of Springfield, Mass.; C. W. Cole, of Albany, N. Y.; E. H. Mark, of Louisville, Ky.; E. F. Moulton, of Cleveland, O.; H. O. R. Siefert, of Milwaukee, Wis.; and Asst. Supt. F. D. Tharpe, of Kansas City, Mo.

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Ssikorski. Whether there is an increase in speech defects from the kindergarten to the grades I had no data to prove; neither had I data to find the percentage of stutterers and stammerers in the different grades and at the different ages. As to the question whether the child with speech defects falls behind in the grades my results were negative, but my data were not full enough to make the results conclusive, since I had data only from Kansas City as to the ages of the children in the different grades.

The report of the Commissioner of Education for 1902 (Vol. II, pp. 1641) gives the total school enrollment as 17,460,000. Applying our percentages to this number we find about 152,000 stuttering and about 278,000 stammering school children. Adding to this 1.25 per thousand of the adult population, as shown by the military statistics, we have in this country about 500,000 people with defective speech, almost half of whom are stutterers.

The careful studies of stuttering that have been made in Europe by specialists is certainly in the right direction and their earnestness deserves to be emulated in this country. The same can hardly be said of the theories. A theory may be quite useful as a working hypothesis if it does not fix firmly definite lines of action as seems to be the case with some of these theories of stuttering. They may be divided into two general classes, namely, the physiological and the psychical. Gutzmann, Coën, Ssikorski and others see in stuttering a disturbance of the nerve mechanism, which may as a result bring about certain psychic disturbances, such as depression, fear of speech, etc.; they emphasize the physiological side of the question. And since they hold that the disease has a neurological basis, their method is naturally on the same basis, therefore they give an elaborate series of exercises that build up and drill the nerve mechanism of speech. They place the whole psychology and pathology of stuttering on a physiological basis, in harmony probably with their general philosophical view. On the other hand, men like Denhardt take the opposite view. Their views rest on the basis that the nervous mechanism is a means of expressing psychical states and not he cause that produces them. Both views seem to rest on the promotor's general philosophy—on rather *a priori* conceptions. If functional nerve disorders could be so easily explained and classified under these conceptions, many now difficult problems of the psychiatrist would be more easy of solution. It would seem to be better to make our theories of stuttering, and so our methods of curing it, more tentative until we have more light on the nature of functional nerve diseases. The etiology and psychology of stuttering must be carefully

studied as has been done by several authors as is shown in this paper, and from these results we must work toward an explanation and a cure, and not make the symptoms and the methods fit certain preconceived ideas. With this spirit we would have fewer standardized methods and less self-satisfaction but better conditions of progress.

METHODS. It is quite probable that stuttering in many cases might be prevented by proper prophylactic measures. Proper precautionary measures should be taken not later than the first appearance of slight disturbances. If the child's speech is too hurried, if its motor speech activity runs ahead of its mental activity and it hesitates and repeats sounds and syllables it should be cautioned to modify its tempo and to know what it wants to say before speaking. It is a good general principle always to lead children to talk in a quiet undisturbed manner. Above all is it necessary for parents and teachers to use patience with children that have defective speech. It is cruel to whip and scold them because, instead of remedying the evil, it makes it worse, and moreover, the child is not to blame for its trouble. The child should be treated sympathetically; should be helped by means of stories and conversations in the most simple and effective language. It should not be made to feel conscious of its speech by insisting on superfine "correctness." The child's attention should be drawn away from its defects; it should unconsciously be led into normal and fluent speech. Nothing should be done that excites fear or anxiety, or that in any way psychically disturbs the child. If there are any physical deficiencies they should be corrected under the direction of a physician.

All writers agree that one cannot prescribe a method that will apply to all cases. The modes of stuttering are so different that each case must be treated individually, and, hence, some writers do not give a general method at all, whereas others give a detailed method of breathing, vocal, and articulation exercises which is to be adapted to the individual cases. Among the latter we find Ssikorski, Coën, A. and H. Gutzmann and others. Treitel lays little stress on breathing exercises, but uses the other two, and Liebmann rejects them all three as not only useless but harmful. Denhardt lays main stress upon the psychical phase of the treatment, a phase also emphasized by Liebmann; and Gruenbaum would strengthen the will by a change in the speech tempo and by vocal exercises. I shall present the methods under the following headings: 1. Breathing exercises; 2. vocal and articulatory exercises; 3. medical treatment.

1. Ssikorski (84) gives considerable attention to the breathing exercises, and divides them into three parts: simple,

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fractional, and compound. Simple breathing consists in simple inhalation and exhalation, and is represented thus | — , | [5-]——, etc. The vertical line represents inhalation and the horizontal exhalation; the figures in brackets signify pauses in seconds. The patient should be drilled in extending the expiration. Fractional breathing is represented thus ¦ [5] — — [5] —— — ———, etc. In this figure the inhalation consists of two parts, and the exhalation of five parts of various lengths; where no figures occur in the breaks there is to be no pause of any length but only a break in the air current. This exercise can be varied to suit the occasion. The aim is to cultivate a broken exhalation as it occurs during speaking. Compound breathing consists in alternating the first two kinds. After a few fractional inhalations and exhalations while speaking one usually breathes regularly a few times, either to facilitate the diffusion of gas or to take a rest, or both, and compound breathing exercises are a preparation for this. These breathing exercises are intended to bring breathing under the control of the will and prevent those breathing disturbances which appear in stuttering. It is moreover, possible, Ssikorski thinks, that the sucking action of the thorax regulates the flow of blood from the head, and that, as Coën says, increased breathing strengthens the chemism of the blood, both of which processes have a beneficent effect on stuttering. During these exercises, he says, the patient should give careful attention to the muscle sensations and should try to produce them mentally.

Coën (50) and Gutzmann (59), give extensive breathing exercises which do not vary very widely from those outlined above. Gutzmann, however, follows the breathing exercises given in D. G. M. Schreber's Zimmrergymnastik which he considers the best book of its kind published (trans. by C. R. Bardeen). H. Gutzmann, does not use divided, or fractional, inspiration. He would, however, give gymnastic drill in addition to the breathing exercises, since that would not only exercise the general musculature of the body but would train the motor centres of the brain as well. All exercises must tend toward enabling the child to use its speech-mechanism normally. Chervin also gives breathing exercises, and says the difficulties of respiration determine the treatment (48a:226).

2. After breathing has been mastered, vocal and articulatory exercises are taken up. Ssikorski first teaches his patients to open and close the glottis. Then by means of the aspirate h one bridges over to whisper the vowels. The h is first given alone, then in connection with ă (as in *at*) in a whisper, and then with sound. The h is a less perfect product than a pure vowel, and hence, is useful as a connecting link. Other vowels are then taken up. To the vocal drill he later adds

articulatory exercises. Breathing must be carefully observed during these exercises. Then composite speech gymnastic is taken up in the following order: 1. repeating after the teacher; 2. reading; 3. reproducing mentally what has been read, as an innervation exercise; 4. reciting what one has committed to memory; 5. talking in a whisper; 6. talking aloud; 7. exercise in modulating the voice while speaking or declaiming; 8. the patient tells orally what he has read, or retells what he has told before; 9. conversation. All exercises, he says, should be adapted to the individual and should begin with the least affected part of the speech mechanism, and gradually work toward a drill of the affected muscles.

Gutzmann, also begins with h, passes to whispered and then to voiced ä (as in arm), all in one breath. Then he drills the vowels, whispered and voiced in continuous and fractional exhalation, passing from the easier to the more difficult. In continuous exhalation the voice should gradually swell to full volume. In passing to words and sentences the same principle is followed. Words with the letter a as initial are taken first; the vowel is begun softly and gradually increases in intensity, thus, | A ——— tem. Other vowels are drilled in like manner. The first sentences, which are taken up later, should begin with a word whose initial letter is a, and the words they contain should be spoken as if they were all syllables of one word.

In order that the stutterer may learn to control his articulatory organs Gutzmann teaches him the physiology of articulation with the aid of a mirror. He is placed before a mirror in which the different muscle actions are shown him. These actions he is led to imitate by focusing his attention on them without thinking of speech, thus: b — bb — bbb — bbbb. The letters w, s, l, r, m, n, j and sh (Germ. *sch*) may be drilled by drawing them long in order to accustom the articulatory organs to producing them with voice, thus: | l ———— a.

Before taking up fluent conversation the stutterer is given the following rules as a guide: 1. Speak slowly and calmly. 2. Always be sure that you know what you wish to say and how you want to say it. 3. Do not speak too loud nor in too low a tone. 4. Stand or sit straight and still while you speak. 5. Take a short, deep breath before speaking a sentence. 6. Be sparing with your breath; hold it back rather than urge it forward. 7. Give prominence to the vocal position. 8. Focus the expiring air not on the consonants but on the vowels. 9. Do not use stress in the formation of sound. 10. Begin the vowel with a soft and somewhat deep tone. 11. Extend the first vowel in a sentence and combine all words as though the whole sentence were but one word. 12. Always speak plainly with a pure and melodious voice.

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As a first drill in independent speech the stutterer answers simple questions. Then he reads simple poetry, later prose, and answers questions on these selections. He must also constantly practice those expressions which he must use in his intercourse with other people. The psychic phenomena, he says, will take care of themselves after the stutterer has confidence in his ability to speak, unless they are a disease in themselves, then special psychic treatment is required.

Coën begins with a vocal drill. The vowel is drawn out as long as possible; then 2, 3, 4 and 5 vowels are sounded successively in one breath. Umlaute and diphthongs are treated in the same manner. In the word drill the sounds are introduced in the following order: 1. vowels, umlante, diphthong; 2. consonants: labials, labio-dentals, sibilants, labio-palatals, gutturals. Later, reading and conversation are taken up on similar lines as indicated above.

Wyllie first informs the patient that his larynx is at fault; that he must pay no attention to his mouth but to his voice. He should read aloud at least 10 minutes every morning. He should know the physiology of the alphabet and have test sentences for the different letters of each stop position: First stop position, p, b, m, w, f, v, th, s, z; second, t, d, n, l, r; third, k, g, ng, h, ch, r. He should note every word that gives him difficulty so that he may refer to the physiologic alphabet (92 : front.) and find the key to its pronunciation. He should not be permitted to speak with empty lungs. Dr. Makuen also would teach the stutterer the physiologic alphabet, and constructs one on the basis of Dr. Wyllie's (74:251). Bernard would have the patient repeat the alphabet at least a dozen times a day at the rate of one letter in two seconds. He asks his pupils to study the alphabet before a looking glass. His first exercise is the first 34 lines of "The Deserted Village," committed to memory. He has 31 exercises in reading and reciting.

Liebmann uses no preliminary exercises. He immediately begins with conversation; he has the patient speak with extended vowels, and most of them, he says, in this way speak fluently at once, and immediately lose all fear of speaking. He praises his patient freely by way of encouragement, and thus restores his self-confidence. Chervin gives breathing, vocal and articulatory drill, but varies from the other authors in so far as he prescribes absolute silence, outside of the exercise hours, for the first week, to secure repose, and that the patient may forget his trouble (48a:231).

A. M. Bell, though he gives some attention to respiration, says the stutterer's "never-to-be-forgotten talisman is: VOICE!" The letters which are special stumbling blocks, such as b, d,

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p, g, t, k, f, wh, th, s, sh, h, should be practiced with vowels, with the principle constantly before the mind that "*no mouth action must be allowed to interfere with the flow of throat-sound*" (40:23). The tendency toward an upward pressure of the jaw should be controlled, and the head should be held firmly on the neck, but not with stiffness that would interfere with free motion. The spasmodic actions will invariably pass away when breathing is relieved, he says.

When one looks over the detailed methods one immediately sees that they are carefully graded, passing from the fundamental to the accessory, and from the simple to the more complex; yet one can but conclude that they are conventional. It is true that all these methods lead to more or less successful results; furthermore, no one can deny the value of drill in proper breathing and no doubt many stutterers are benefited thereby, just as many people with normal speech would be; but, since it is proved that stuttering can be cured without such drill, it seems rather dogmatic to prescribe it in a stereotyped manner. Neither need one categorically class all such exercises as useless, since some stutterers may be in need of them. Moreover, we always have a tendency to follow tradition and this tendency manifests itself in the schematic breathing, vocal, and articulatory exercises so much in vogue in Europe and which are being introduced into other countries, even into Japan (52). Are these exercises an essential part of the therapeutics of stuttering? is at least an open question. Though the promoters of these didactic systems all insist more or less on individual treatment, yet their systems are such that they have a tendency to methodize the treatment to a uniform standard, whereas the nature of the disease urgently demands individual treatment. A breaking away from these forms as, for instance, Liebmann has done, is a healthy sign and shows that possibilities are being explored. The methods used by Wyllie and Makuen seem better adapted to stammering than to stuttering.

It is the prevailing opinion among the authorities referred to in this paper, that the speech specialist should be a physician. One readily sees the reason for this view when one considers that so many physical anomalies are vitally connected with speech disturbances. However, a better plan would be that of Dr. Makuen, who holds that it takes a specialist, assisted by a special teacher. In that way we are more apt to have the clinical and the didactic features at their best. Furthermore, both physician and teacher should have a thorough knowledge of the physiology of speech, and since stuttering is often accompanied by psychic depression they should have, at least, an elementary knowledge of that chapter of morbid psychology.

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3. *Medical Treatment.* Pharmaceutical treatment for stuttering has been recommended since the time of Hippokrates. At the present time general prescriptions for stuttering are not used. Ssikorski insists on these points: 1. The patient's bowels should be kept open, and he should not eat anything that irritates the intestines. 2. The blood supply in the nerve centres should be regulated by strengthening the vaso-motor system. 3. All psychic excitation must be removed. Bromides may be used to quiet the nerves but depressed patients may be given stimulants. 4. There should be a general building up of the nervous system by means of hydro-therapeutics and electricity. The constant current is used for the vaso-motor system and static electricity to modify nutrition in general. If the speech centre is to be innervated the anode is placed on the head over the speech centre and the cathode in the neck. Gruenbaum galvanizes the lips, tongue, palate and larynx, especially with children.

Gutzmann thinks medicines should ordinarily not be used, though in extremely nervous cases, where hydro-therapeutics fail, he uses mono bromide of camphor in doses of 0. 3 to 0 .5, three times a day. He uses the current only for the larynx when it shows spasmodic disturbances—anode on the larynx, cathode in the neck with a current less than one ten thousandth of an ampere. The removal of physical abnormalities should be placed in the hands of a physician.

Makuen says all irregularities of a structural or pathologic character should be corrected. Free action of the tongue should be made possible by snipping the frenum if it be too short, and, if necessary, by a division of the anterior fibres of the genio-hyoglossus muscle. Aside from this, the treatment must be educational. Bernard always prescribes a compound of arsenic and strychnine—a method not approved by the best writers in this field.

Severe costiveness seems to be common among stutterers. Ssikorski says it is one of the most common complications of stuttering, even cases of many days' standing are found—a condition which always increases stuttering. Gutzmann, in his clinical experience with stutterers, has found cases of constipation lasting as long as two weeks without yielding to the most energetic means. It is quite evident that in such cases proper dieting should be carefully carried out in connection with abundant exercise in the open air. Since *eneuresis nocturna* is very common with stutterers, as some think it is, the amount of fluid taken in the afternoon should in such cases, in addition to the above precautions, be reduced to a minimum. These regulations bring about healthy sleep, an absolute essential to the physical and psychical well-being of the child.

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And when we consider that onanism is quite common among stutterers, as is observed by a number of writers, the need of proper exercise, proper dietetics, and proper bathing becomes all the more emphatic.

Whether hypnotism should be used is an open question. Coën (49:170) would not use it. The temporary relief which it brings is too costly, he says, since oft repeated hypnotism gives permanent injury to the nervous system. Chervin (48a:202) says hypnotism has a tendency to increase the patient's already too great excitability, and to weaken the already too weak will and hence he has nothing to gain by it. Gutzmann (59) agrees with the above authors as to the injury it may cause and would use it only as an *ultimo ratio.* Denhardt does not believe in it and Berkhan leaves the question open though he has tried it with no satisfactory results. Laubi agrees with Gutzmann that in most cases one can get along without it, but holds that a physician may use it with a good conscience if he finds it more interesting or if he thinks it enables him to reach his goal quicker (68:129). Heymann (61:206) says hypnotism should in no case be left untried, and Gruenbaum (54:58) uses it to cure the slight paralysis of the speech centre which, he says, is the cause of stuttering, and thinks that hypnotism in the hands of the physician has become a blessing for man.

The length of the course to obtain a perfect cure varies. Klencke makes the course from 5-6 months; Coën from 4-5 months. Ssikorski says 6 months is probably the average. Gutzmsnn says a course of 2-3 months is sufficient. Liebmann's course is 4 weeks with half-hour sessions, daily. Chervin's coursé is 3 weeks, but at the end of his course he considers the patient only convalescent; a good, serious student should continue his exercises one month longer, working 2-3 hours a day. Denhardt's course is only 16 days, but he drills his patients 5 hours each day. It is quite evident, as all writers point out, that the length of the course depends upon many different things, such as the nervous condition of the patient, his general health, the severity of the trouble, the interest the patient manifests in his cure, etc. It is difficult to give a definite prognosis even after a preliminary examination. It is also quite possible that the length of the course may vary with the method.

Stuttering is treated so successfully at the present that where free public courses are offered there is very little excuse for a youth to be afflicted with the trouble. Colombat, 1827-1840, had 428 patients of whom 52% were cured, 21% improved, and 27% were dismissed as failures. Blume, in the early 40's, reported 70% cured of a total number of 40. Coën, in 1886,

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gives his results as follows: Cured 60%, improved 30%, failures 10%. Berkhan directed public courses in Brunswick, 1883-1885, which were attended by 96 patients—the worst stutterers in the community were selected. Of these 65 were cured, 30 improved, and 1 failed. There were 25 relapses in all. Gutzmann gives the result of public courses in 46 German cities. These courses were attended by 1,390 stutterers of whom 72.7% were cured, 23.6% were improved, and 3.7% were failures. Of about 1,000 patients who attended A. Gutzmann's polyclinic, 87% were cured, 10% improved, and 3% were failures; 5% of the cases relapsed. Of 600 patients who took private instruction from Dr. H. Gutzmann, 89% were cured, 9% improved, and 2% failed. Of the first 400 5% relapsed, but of the second 200 only ½%. Of 700 patients who attended his polyclinic, 1892-1898, the results were not so good on account of irregularity of attendance. Of 95 patients who took Oltuszewski's complete course, 87 were cured and 8 very much improved, and he thinks they would have been cured had they repeated the course. Dr. R. Coën's report of 1901, of the public courses for stutterers in Vienna for the preceding 10 years is as follows: Number that attended 158, cured 60%, improved 30%, failures 10%. He ascribes the failures entirely to laziness and irregularity of attendance. Chervin (48a:241) says success is always certain if the subject is docile, attentive, diligent, and persevering, but those qualities are indispensable.

These data show that stuttering is a disturbance that is quite curable. So much so that in some countries of Europe great efforts are made to relieve the suffering. Denmark has a public hospital for the cure of speech defects, and also offers public courses of treatment to children of school age. In Germany public courses are offered to school children in probably all communities where there are enough children with defective speech to make a course advisable. There are also several private clinics in charge of thorough specialists. Hungary also offers public courses to school children. It also has a central hospital where normal courses are offered to teachers at the expense of the State. A careful census is taken of the children with defective speech in the different communities, and those that have the greatest number of children with speech defects are given the first opportunity to send teachers to these teachers' courses. The number that may attend these courses at any one time is limited. In Russia and France there are clinics for speech defects, but whether there are public courses for children the writer was not able to ascertain. From private correspondence it seems that no statistics of

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speech defects exist and no public courses are offered in England.[1]

In this country very little is done outside of private institutions, the high scientific character of some of which seems to be doubtful. Some directors of private institutions have their methods copyrighted—a cheap method of advertising an assumed originality—and one even courts patronage by disparaging the work of other institutions. The only public effort in this country to correct speech defects, as far as the writer knows, is in the Philadelphia Polyclinic where there is a department of speech defects in charge of Dr. Makuen. When we consider that there are probably over 200,000 stutterers and nearly 280,000 stammerers in the United States we can realize that it would be a proper function of the State to furnish measures of relief.

Furthermore, the classroom teacher in the schools should have a general knowledge of functional speech disturbances. Worry, embarrassment, excitement, etc., are immediate causes of speech defects. If the school is a place of nervous tension; if the child is constantly worried with adult forms and abstractions ill-fitted for its little mind; if it is asked to express its confused ideas under the eye of a critical teacher who perhaps considers her day's work to consist of 5 or 6 long, weary hours of wearisome labor—we have conditions for functional speech disturbances to set in, especially so since oral speech is not absolutely fixed till early adolescence. The school should rather use its opportunities to cultivate good oral language by means of stories, conversations and other oral exercises given sympathetically under the influence of a good model. The high percentages of stuttering during the first few years of school life is probably largely due to nerve tension[2] and could be reduced considerably if the child in all cases had high minded teachers who understand child-nature, and who find their own life in the happy, exuberant life of the child; teachers who know how to subordinate deadening forms and can make the life of the school so free and so unrestrained, that fear, worry and its train of evils are unknown in their presence —teachers who can live with the child and organize its wealth of incoming information from the child's viewpoint, and encourage it to react with oral expression as simple, as unaffected, as natural as the life of the child is itself.

We may summarize thus the following points concerning speech defects:

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[1] For information on this subject I am indebted to the kindness of Dr. R. Langdin Down, of Hampton Wick, Miss Kate Stevens and Mr. Wm. van Praagh, of London, England.

[2] Hartwell thinks it is due to bad methods of teaching reading—a thought which deserves serious consideration.

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1. Inheritance seems to be a predisposing factor.
2. Anything that disturbs the nervous system of the child may be an immediate cause, especially acute diseases.
3. Suggestion is a factor in the spread of the disease.
4. Stuttering is a children's disease.
5. Second dentition and puberty are periods that favor stuttering.
6. Boys are more subject to the trouble than girls.
7. It probably retards pupils in their school work.
8. Stutterers are not mentally inferior.
9. Speech defects are often the source of severe psychical depression.
10. The seriousness and the spread of the trouble is such that it deserves more attention from the public and the specialist than is given it in this country at the present time.
11. Stuttering and stammering are, with probably very few exceptions, curable.

I wish to acknowledge my great indebtedness to President G. Stanley Hall for suggesting the general topic of this study, and for valuable suggestions and criticisms; to the other members of the department faculty for suggestions; to Mr. Louis N. Wilson, Librarian of the University, for invaluable aid in securing the literature and in gathering the data; and to Mr. Samuel S. Green, Librarian of the Worcester Public Library, for various courtesies.

The bibliography which follows contains only those works which are referred to in the text. No. 84 contains a good bibliography of the older works on stuttering, and Wilson's bibliography is the standard in child study. The Voice, a magazine published in Albany, N. Y., 1879–85, and later in New York City, has translations of some of the earlier methods practiced in Europe for the cure of stuttering. The student should always consult the standard bibliographies in Child Study, medicine, and psychology. Reference to the bibliography is by number; (25:37) means No. 25, Shultze, F., Die Sprache des Kindes, page 37.

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DYNAMIC BIOLOGY AND ITS RELATIONS TO HIGH-SCHOOL COURSES.

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I.

Every living organism represents a certain force, does a certain amount of work in the economy of nature. Multiply this work by the number of individuals and we have an expression for the power of the species as a whole. This point of view is definitely expressed in our title. We already have "dynamic geology," "dynamic astronomy," "thermo and electro dynamics," "dynamo" and "dynamite;" and when we begin to realize the forces of living nature, we are fully warranted in applying the term "dynamic" to biology.

With due respect to current methods of teaching, it has often seemed to me—and I find this reaction quite general among biologogical students—that when we were fairly ready to begin the study of a type, we were hurried on to the study of something else, and so on; ever reaching out after knowledge, but never attaining to wisdom. May not this feeling of insufficiency, the haunting question "*cui bono*"? be accounted for in part, at least, by the fact that the largest values both scientific and human centre about what living organisms do? Then, again, when we look toward the future of the science, what large field except this remains to be broken? We have land and sea explored and certainly enough species described to begin with, and form and structure has been worked out almost to the limits of microscopic vision. Surely refined biometry of the dead form cannot rival in importance scaling the total energy output of species alive and at work.

May we not find here also an explanation for the general relation of the public to things biological in the fact that our college and university courses have become too static, too exclusively engrossed with the dead type form? I have tested popular interest in many ways, and any one may do this for himself. Ask the average man: How many birds, insects, fishes or reptiles do you know? Or to be more specific, ask the people of your acquaintance or with whom you walk whether they are acquainted with this plant or tree, bird or insect. We know what the answer will be; or if, perchance, we get some faint echoes of a college or high school course, it will be: "Yes, we did study a little anatomy of the frog, earth-

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worm and grasshopper, but thank the Lord I have forgotten it all."

Or, go into the bookstore in a town or small city—not a college town, of course—and ask for a zoölogy. You will have to explain that you want a book about animals, and then the shopkeeper will look at you as though he had no idea of your meaning and tell you he has no call for books in that line. On one occasion an old man did bring down from an upper shelf an antedeluvian volume—"Animals of Myth and Legend;" and another trotted out with great alacrity, as though he had found a purchaser at last, "Wild Animals I have Known." This, as a result of perhaps thirty trials in several different States, may be taken to represent the relation of the people in general to the life about them. People know, and what is worse, care nothing about it.

I am inclined to attribute this condition to the kind of biology taught in our colleges and universities; and this has sifted down through college educated teachers into normal schools and high schools, until now even in the grades—up to within a year or two, at least—the dead, type-form, anatomical method of study holds the field. Some eminent teacher, Agassiz or Huxley, of a former generation, selected a certain animal as a type, and, because its anatomy was then unknown, he worked it out and taught it in a manner to him living and vital, because closely related to his own investigations. Is this any reason why at the present time, with hundreds and thousands of forms alive and at work everywhere, we teachers, like sheep jumping over a fence, must get the identical animal—probably pickled in alcohol—and must attempt to teach it in the way adapted to the needs of a generation or more ago? Why, as Schmeil so well puts it, should teachers of biology build in the minds of their pupils either air castles or moss-covered ruins?

Practically up to the present the questions put to living things have been: What are you? What is your name? How are you formed and what are your relations? Where did you come from?

The moment we put the question: What do you do in the economy of nature? What are the laws and conditions of your active life? We find ourselves with the most familiar forms, and, whichever way we turn, on the brink of human knowledge. This in itself is inspiring; but when we begin to realize the magnitude of the forces which living species wield and the intricacy and delicacy of their manner and conditions of action, we find that we have entered a field that will return to patient cultivation harvests of untold value for centuries to come. Indeed, when we ask: What is the ultimate value of classification and all the comparative form-study on which it

depends? it seems difficult to answer, unless we say that all such knowledge, so far as it is sound, may serve as a foundation from which to investigate the forces of living nature with a view to understand the laws of their action and to discover means to utilize and control them.

The physicists and chemists have outstripped the biologists and in general have given to the courses in these subjects a dignity and a position in our schools which biology lacks. And they have done this in the main by developing practical knowledge of the forces of inanimate nature; while, biologically, we have been content to remain behind in the age of the ox-cart as concerns any serious effort to learn and to teach the magnificent forces of living nature.

It is suggestive in this connection to recall the fact that the fundamental and primitive relations of mankind to living nature have been formed mainly on the dynamic side. Domestication of animals and cultivation of plants is dynamic biology in the rough. It is thus, in a way, the tap root of biological science. Since my attention has been called to this point, I have been surprised to note how often young children, on finding some animal or plant that is new to them, ask: "What can this thing do?" or "What will this do to you?" "Is this good to eat?" "Is this poison?" and so on. A little later, of course, as language develops, the first question comes to be: "What is it?" And while this is commonly assumed to be the first reaction of the knowing mind to its environment, since reality and experience are deeper than language, and the emotions and will, than intellect, may we not have here a more fundamental relation than is generally recognized? Then, further, if the child finds that the animal or plant possesses some power for good or ill he will wish to learn more about it.

Modern developments of this primitive phase are seen in the work of the Department of Agriculture and the United States Fish Commission. But while this marks a great advance in some respects over the efforts of earlier races, it is still, so far as scientific character goes, dynamic biology in the rough. After expenditure of millions of dollars and all these years of puttering and fumbling, we still lack any adequate expression for the value, either biological or economic, of a single species of bird, amphibian or reptile, and of few, if any, fungi or insects. With bulletins galore on the value of the different birds from the Department at Washington and the various State Experiment Stations, and filled with abundant advice as to means of increasing and protecting them, I have yet to see either in Washington or in any of the States I have visited any special provision for birds or other insectivorous animals. On the one hand we have in print the most emphatic denunciation of the

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English sparrow and recommendations for its destruction. In reality I have never failed to find English sparrows the most numerous bird about the Agricultural Department grounds in Washington or on the station grounds in the different States. Cats are known to be the worst enemies of insectivorous birds, and I have reports from private farms on which their extermination was followed by a remarkable increase of birds, but I have yet to learn of an agricultural college or experiment station where they are not kept in numbers and allowed to prowl at will. On the one hand we have Koebele's splendid achievement in the introduction of the Vedalia to control the cottony-cushion scale, on the other, the failure of the Massachusetts Legislature to accept his offer to import the natural enemy of the gypsy moth. On the one side are Forbush's and Kirkland's studies with birds and toads in destruction of gypsy moths, on the other, no serious attempt in the infested districts to develop and utilize the living forces discovered. With the light breaking the dawn is slow, and practical biology remains a good deal of a muddle. To dispel the fog, clear the air, and vivify and render the whole subject consistent we need a well developed science of the forces of living nature.

An interesting sidelight is shed on our subject by many of the nature worships and superstitions. These probably developed later than the primitive relations just alluded to, and they again show, however distorted and magnified, man's deeper sense of the overwhelming powers of life. Plagues and pestilences and diseases were looked upon as divine visitations, and in the sense that the laws of nature are the laws of God, ancient interpretations were not so wide of the mark. Ignorance of laws yields no exemption from penalties, and these calamities are now generally recognized to be purely biological phenomena, forces of living nature operating under definite and discoverable laws.

In fact evolution in its various forms is dynamic biology. All the theories which maintain that living forms are rigid, immutable, predetermined, in brief, all the fatalistic theories of life, may be grouped for convenience under the term static biology. Of course, the two are seldom seen in their purity. The static or fatalistic philosophy naturally came first, and dynamic elements are mingled with it throughout, but these natural forces it weakly acknowledges to be too vast for human influence or control. So, too, evolution or the dynamic philosophy, while it blossomed in Lamark and Darwin, had its roots back among the Greeks, and still has tenacious fibers projected into it from the older static thought. Still, the terms, static and dynamic may be conveniently taken to represent the two poles about which all philosophies of life tend to group

themselves. It must also be remembered that these two attitudes toward life in general are expressions purely of human faith and have no outward warrant or reality in nature itself. Thus naturally in the early times of human weakness and ignorance the forces of nature seemed irresistible and a static, fatalistic philosophy was the logical result. Later, as knowledge grew by patient research, and the forces of nature were found to be amenable to knowledge and control, evolution and a dynamic philosophy of life broke through the crust of human thought, and the slow process, which had so long been carried on by the few braver souls who had faith in nature, has at last begun openly to contest the field. While thus a matter largely of temperament and majority, some always choosing the static and others the dynamic philosophy of life, and many vascillating in their choices, since men are reasonable and tend to form their judgments on the basis of what they know, it becomes at bottom a matter of education. Whether we have the static-fatalistic or the dynamic-progressive theories of life predominant will thus depend upon the kind of biological education we develop.

I take it that fatalism in all its various forms is the logical consequence of a static theory of life; and this in turn arises from an inadequate or faulty education in regard to means of controlling the forces of life. Thus the sense of weakness and inadequacy crystallizes into a rigid philosophy. It is the theory that nature is too heavy to lift, that the world will wag as it always has, no matter what we try to do about it. This philosophy of life finds its classical expression in the familiar words of Solomon:

"Vanity of vanities, saith the preacher, vanity of vanities; all is vanity. What profit hath a man of all the labor which he taketh under the sun? One generation passeth away and another generation cometh! but the earth abideth forever. The sun also ariseth, and the sun goeth down, and hasteth to the place whence he arose. The wind goeth toward the south, and turneth about unto the north; it whirleth about continually, and the wind returneth again according to his circuits. All the rivers run into the sea; yet the sea is not full; unto the place whence the rivers come, thither they return again. All things are full of labor; man cannot utter it; the eye is not satisfied with seeing, nor the ear filled with hearing. The thing that hath been, it is that which shall be; and that which is done is that which shall be done; and there is no new thing under the sun. . . . I have seen all the works that are done under the sun; and, behold, all is vanity and vexation of spirit. That which is crooked cannot be made straight; and that which is wanting cannot be numbered. . . . For in much wisdom is much

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grief: and he that increaseth knowledge increaseth sorrow. . . . Therefore I hated life; because the work which is wrought under the sun is grievous unto me: for all is vanity and vexation of spirit."

This is a cheerful view of life, is it not? Everything goes round and round in an idiotic circle. It is no use to do anything, because some one else has done the same thing before. The more we learn, the more we want to know, hence the worse we are off. Things are as they always have been and forever shall be. We may as well hate life and be done with it.

But from this slough of despond it is our good fortune to be set free.

"A boundless hope has crossed the world," and the essence of this hope is to be found in the biological doctrine of evolution. This doctrine has been much abused, misrepresented and misunderstood, but it means at bottom simply that there is progress, a movement from low toward higher in the life of the world; that life does not run round in the idiotic circle with "vanity of vanities and vexation of spirit" as the end result. John Tyler states the argument in the following pointed manner.

"Was there ever a nation of grander promise than Greece or Rome? But Greece died of premature old age, and Rome of rottenness begotten of sin. But each of them, you will say, left a priceless heritage to the immortal race. But if Greece and Rome and a host of older nations, of which history has often forgotten the very name, have failed and died, can anything but utter failure await the race? Is human history to prove a story told by an idiot, or does it 'signify' something? Is the great march of humanity, which Carlyle so vividly depicts, 'from the inane to the inane, or from God to God?'"

"This is the sphinx question put to every thinking man, and on his answer hangs his life. For according to that answer, he will either flinch and turn back, or expend every drop of blood and grain of power in urging on the march."

This faith in progress is the dynamic as distinguished from the static, imbecile, *laissez faire*, fatalistic philosophy of life. What can we need more than this faith in our educational system? Evolution is beginning to mean something. If all nature is struggling up from lower toward higher forms, what are we here for? We are here to work with the rest of nature for progress. Evolution means that the world is growing better, that every effort in the right direction helps to make the world better, that with all—or as many as we can win over to this way of thinking—working together the world will move toward the good faster than it has under the doctrine that life is vanity of vanities. New things have appeared and will continue to

appear under the sun as discoveries are made. Paradise will be regained by intelligent and unified human effort—a thing infinitely better than having paradise thrust upon the world from heaven. Under the old philosophy man whined because he was not permitted to lie in the shade and have the forces of nature make the world a paradise for him. Under the new philosophy he sets to work to control the forces of nature, thankful for the mental and physical exercise which keeps him awake and alive.

Evolution is wider in its applications than the science of biology. Besides reaching back into astronomy and geology it lies especially close to historical and sociological studies. This is true, since the life of mankind is but a part of the larger life of the world, and the laws of the life of human history are deeply rooted in the history of all life. As John Fisk says:

"If I may cite my own experience, it was largely the absorbing and overmastering passion for the study of history that first led me to study evolution in order to obtain a correct method. When one has frequent occasion to refer to the political and social progress of the human race, one likes to know what he is talking about.

"Now what does all this drift of scientific opinion during more than two centuries mean? It can of course have but one meaning. It means that the world IS in a process of development, and that gradually, as advancing knowledge has enabled us to take a sufficiently wide view of the world, we have come to see that it is so. The old statical conception of a world created all at once in its present shape was the result of very narrow experience; it was entertained only when we knew an extremely small segment of the world. Now that our experience has widened, it is outgrown and set aside forever; it is replaced by the dynamical conception of a world in a perpetual process of evolution from one state into another. The dynamical conception has come to stay with us. Our theories as to what the process of evolution is may be more or less wrong and are confessedly tentative, as scientific theories should be. But the dynamical conception, which is not the work of one man, be he Darwin or Spencer, or any one else, but the result of the cumulative experience of the last two centuries—this is a permanent acquisition. We can no more revert to the statical conception than we can turn back the sun in his course. Whatever else the philosophy of future generations may be, it must be some kind of a philosophy of evolution." (Century of Science, pp. 42 ff.)

Human history thus is in part dynamic biology and since man is the great moulding and controlling factor, we must

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never lose sight of human relations to nature in all our biological education. On the older view, the most despairing; under the newer ideal, the most inspiring fact of all human history is the origin, growth, florescence, maturity, and then the senescence, decay and dissolution of all the great civilizations. Whole animal and plant species have run the same cycle, have arisen, flourished, dominated the life of the world for a time and then died out under altered conditions or stress of competition with other species. This is also for most animals and plants the normal cycle of life for the individual. It would require a separate paper, much too theoretical for our present limitations, to even outline the biological factors involved and their relations to the human problem. It is sufficient for our present purpose to say that not all organisms follow the cycle just described. Forms with great plasticity, notably among the microscopic animals and plants, seem to be practically eternal, or, at least, able to maintain their adjustments to our present order of nature for indefinite periods. This power seems also to inhere in the germ cells of higher animals and plants. It is only as life becomes rigid, static, unable to adjust itself to new conditions that the law of senescence comes into play.

It has been remarked that religion rocks the cradle, while philosophy bends over the grave of every civilization. There is still another muse—Science. Is it beyond the bounds of possibility that somewhere in the universe of truth there may be a "fountain of eternal youth" for a human social order, and that by diligent research She may discover it? Is it not possible that by knowing enough of the laws, the forces and the resources of life, a civilization may endure and continue to grow into ever stronger and fuller life?

Evolution gives us no uncertain answers to this momentous question. If life in the world has worked and struggled up from the lowest microscopic forms to man as we know him; what can prevent its reaching up to ever higher and higher types of men? We may refer in this connection to John Fisk's "Destiny of Man," or Drummond's "Ascent of Man." In fact, recent biological literature is beginning to tingle with the new life of this idea. In his technical treatise on physiological chemistry Bunge states the argument in a word as follows:

"Do not misunderstand me to say that I recognize any barrier as insurmountable to Science. No, Science is daunted by no self erected barriers. Science will ask ever bolder questions and find ever truer answers. Nothing can arrest her in her victorious march. Even the limitations of the human mind cannot do this: for even these may be perfected. There

is not the slightest reason to believe that a continuous development toward higher forms which moves the entire organic life on our planet has reached its goal in this our generation. The time was, when the only sentient beings upon the earth were microscopic infusoria whirling about in a primordial ocean; and the time will be, when this earth shall be ruled by a race of men that shall rise as much superior to us in intelligence as we are superior to the amœba. The progress of science is infinite."

Whether this shall apply to our civilization must depend largely upon the kind of biological wisdom we develop. And the kind of biology that is woven into the warp of modern life must in large measure depend upon the courses which we succeed in weaving into our educational system.

I recently had the good fortune to discuss the present situation at length with Professor Whitman; and he said emphatically that our biological courses had fallen into a state of "*dry rot.*" What with microscopes and microtomes, skeletons, museums and dissecting instruments usurping the whole field, life itself with all its power and movement is being crowded out of our so called biological courses. Why is this so, and how is it possible for such an incongruous condition of affairs to occur—laboratories for the study of life so completely engrossed in mere dead form? It is, of course, much easier to study and to teach dead form than living activities. When men get sedentary, they are apt to become physically weak; and then there is an almost irresistible undertow toward a static philosophy of life. Of course these teachers bring together a series of type forms that present a spectral parade of the living evolutionary process. But who is interested in ghost dances? Why not have the real thing? As an object of abstract thought the spectral series of type forms has its uses, but, it seems to me, that such pure abstractions which have no relations to the life of the community belong back in the dark ages—to the ages of dreams and nightmares, before humanity had waked up—to the age of dull scholasticism and metaphysics, when men spent their time disputing about how many angels could dance on the point of a cambric needle. Man is now the all important factor in organic evolution, and where does he come into the scheme? Our type-form biologists will soon have stuffed specimens of him to stand at the head of their series in the museums. The way we have lapsed into static biology is enough to make Darwin turn in his grave in Westminster Abby.

Every living organism represents a certain force, does a certain amount of work. Determine this with the greatest care for the individual and multiply by the number of individuals of the species and we gain an expression for the power of a

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species as a whole. We learn the species, not merely as a dead form, but as a force in nature. And further, study all species of animals and plants from this point of view—or for practical courses, select dynamic types—and we develop a picture of nature as a vast stream of living forces acting and reacting upon one another, a picture of nature as it lives, moves and has its being; and we gain a view of the dynamic process of organic evolution.

If we may grant, at least provisionally, that it is desirable to put a thorough going dynamic biology into our educational system: How shall we accomplish it? What lines are fundamental? How shall we choose subject matter? How shall we stratify the subject for educational grades—for the grammar and high schools, the college and the university?

When the problem first formulated itself in my mind—about seven years ago—I answered without hesitation: make the latest and best results; the strongest and largest ideas, generally available. Do away once for all with the prevailing notion: "the world owes me a living," and by teaching the struggle for life and natural selection, establish, presto, in the public mind the stern fact that the world may owe a hanging instead, and so displace the old with the new ideal—basally true to all nature and to the organization of society as well—that the first duty of each man is to make himself fit to survive. Copious lecture notes and manuscripts were produced —I now thank my lucky star that none of them were printed—during this balloon voyage among the clouds of educational theory; but the air was thin and chilly, and I was lonesome. Many of the younger German educators are just now in high chase after this brilliant, educational meteor, but I doubt if they catch it until it reaches the earth, and by that time they may realize that the earth is larger than the meteor. So is human sympathy and love of nature larger than any science or any pet theory of education; and the forces of living nature with their infinite complexity and adjustments and their discovered and undiscovered relations to human life and happiness reach out in every direction far beyond our formulated theories of organic evolution. So I awakened from my dream of doctrinal evolution in the grammar schools to the realization that we must have first a broad basis of general knowledge and acquaintance with nature; that thousands of years of struggle and conquest and hate and love of nature preceded our modern formulations; that Darwin himself as a mature and learned man incubated his great idea for twenty years and then was hastened into trusting it with the public.

I have endeavored to formulate my own creed with reference to this deepest stratum of biological education in three articles

which appeared in this *Journal*[1] and in my book, Nature Study and life.[2] This stratum is the vital part of our entire system of education as relates to the establishment of a philosophy of life. It is the bed rock upon which we must build. With this reference, then, we may go on to consider the strata adapted to high school instruction.

Research, as we ascend the scale, becomes more and more essential. In fact, research is the breath of mental life, whereas memory is merely the bodily form of education. It is the human side of the process of evolution. Nature's challenge to man has ever been: find me out, and I will be your friend and servant. If you do not, I will destroy you. To live in dependence upon authority is nothing short of parasitism. It is easier than to live by research and so systems of authority are developed which save men the trouble of living and lead them around in the circles of vanity. Like water, which can never rise above its source, all such systems tend to become stagnant and prevent rather than encourage progress. It has always seemed to me that in originality the spirit of the child is ideal and that to keep it fresh and alive throughout the necessary drudgery of elementary schooling is the special function of nature study.

Nothing can illuminate this point like a glimpse over the historical development of biological science. For tangible beginnings, at least, we must go back to Aristotle and the Greeks—about 2200 years. A science must first collect its facts and sift them from prejudice, superstition and fanciful imaginings. Aristotle, the friend of Phillip and teacher of Alexander the Great, has been called the best observer the world has produced. He is said to have had the assistance of their armies in collecting specimens for his researches, and his works on the History of Animals and on the Parts of Animals contain a mine of wonderful richness. It is remarkable how many of our nature saws we owe to Aristotle. Here are a few samples of the kind of biology that Alexander the Great was brought up on.

"The part of the head by which we hear, but do not breathe, is the ear; for Alcmaeon is mistaken when he says that goats breath through their ears. Man is the only animal that has ears and cannot move them."

"Observations have been frequently made on the instinct of the hedgehog, for when the north and south winds change, those that dwell in the earth alter the position of the entrance of their burrows; those which are kept in houses alter their position from wall to wall, so that they say that in Byzantium

[1] Foundations of Nature Study. *Ped. Sem.*, Vols. VI and VII.
[2] Nature Study and Life, Ginn & Co., 1902.

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there was a person who obtained the character of predicting the change of the weather, from observations made on the hedgehog."

"The swan also is web-footed, and lives in ponds and marshes. Its manner of life and disposition is good, and so is its manner of rearing the young and its old age. If an eagle attacks the swan, it defends itself and comes off victorious, but will not commence the fight. Swans have the power of song, especially when near the end of their life; for they then fly out to sea, and some persons, sailing near the coast of Libya, have met many of them in the sea singing a mournful song, and have afterwards seen some of them die."

"The most laborious of all insects, if compared with the rest, are the tribes of the ants and bees. Every one may see the diligence of the ant; for it is on the surface, and that they always travel in one direction, and make a store and treasure-house of food, for they work even in the night when there is a full moon."

"Butterflies are produced from caterpillars, and these originate in the leaves of green plants. At first they are smaller than millet, afterwards they grow into little worms, in three days they become small caterpillars, afterwards they grow and become motionless and change their form. In this state the creature is called a chrysalis. It has a hard covering, but moves when it is touched. They are united to something by web-like processes, and have no mouth nor any other visible organ. After a short time the covering is burst, and a winged animal escapes, which is called a butterfly." Of a certain caterpillar Aristotle says: "From this animal some women unroll and separate the cocoons and afterwards weave them. It is said that this was first woven in the Island of Cos by Pamphilla the daughter of Plateos."

From a study of his works we see that Aristotle was a tireless investigator, fearless in questioning authority, careful and accurate in observation far beyond his time, and still his method is not rigidly scientific, and he is often led into romancing by plausible hearsay and many of his interpretations are vitiated by preconceived notions of the fitness of things. We are especially struck with the living dynamism that permeates all his biological work. He studies the parts of animals to discover their functions, and animals themselves largely to gain a knowledge of their uses to man and their various activities. Thus despite its shortcomings Aristotle's work had the virility to dominate science for nearly two thousand years. All through later Grecian and Roman times and up through the middle ages his word was law, to doubt which was heresy. Research was no longer necessary. To find out the truth, simply read the

book and learn what Aristotle said about it. If facts did not agree with the book, then facts must be wrong. If we substitute the dead letter of authority for the living spirit of research, we have mental stagnation and death; and all dead things, whether human minds or oak trees, tend only toward disintegration and decay. So the science of biology lapsed into decadence for two thousand years after Aristotle.

Dropping down about four hundred years we may take a sample or two of Pliny's biology.

"Some persons," he says, "recommend that three crabs should be burned alive among the trees on which the vines are trained, to prevent these from being attacked by coal blight." Also that, "If a bramble frog is buried in a new earthen vessel in the middle of a cornfield, there will be no storms to cause injury."

Fish stories are notorious, and here is a little one of Pliny's:

"In the city of Iasus there was another boy, also Hermias by name, who in like manner used to traverse the sea on a dolphin's back, but on one occasion a tempest suddenly arising, he lost his life, and was brought back dead; upon which the dolphin, who thus admitted that he had been the cause of his death, would not return to the sea, but lay down upon the dry land, and there expired."

Pliny's human anatomy is no less wonderful. He tells us of a race of savage men whose feet are turned backwards relatively to their legs. He also describes another race of men, "who are known as Monocoli, who have only one leg, but are able to leap with surprising agility. The same people are also called the Sciapodae, because they are in the habit of lying on their backs during the time of extreme heat, and protect themselves from the sun by the shade of their feet." "These people," he says, "dwell not far from the Troglodytae, to the west of whom again there are a tribe who are without necks, and have their eyes in their shoulders."

Pliny, it is said, was paid enormous sums for his books. He represents the kind of natural history the Romans wanted. Among people who have no regard for truth there can be no conception of its value; and hence it is not the man who can discover and tell them the most truth, but the man who can tell the biggest stories who is in demand. The craving for the "wonderful" is deeply rooted in human nature, and we have just now, possibly, a recrudescence in what John Burroughs calls "Sham Natural History," and, as in the times of the Romans, the books sell better than almost any others. Still, as truth is stranger than fiction, I am inclined to think that any help we need will come from displacing the "sham" with a

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truer and more living natural history rather than by futile controversy.

Coming down now sixteen hundred years we may take another sample of biological teaching. This is nothing less than a receipt for raising snakes by the most learned and illustrious Jesuit physician and naturalist, Athanasius Kircher.

"Take some snakes," he says, "of whatever kind you want, roast them and cut them into small pieces and sow those pieces in an oleaginous soil; then, from day to day, sprinkle them lightly with water from a watering pot, taking care that the piece of ground be exposed to the spring sun, and in eight days you will see the earth strewed with little worms, which, being nourished with milk, diluted with water, will gradually increase in size till they take the form of perfect serpents." He adds that he learned all this from once having observed in the country "the carcase of a snake covered with worms, some small, others larger, and others, again, that had evidently taken the form of serpents."

Possibly Kircher thought he was safe in writing this, because no one would ever wish to raise snakes, but he was mistaken. An Italian naturalist, Redi by name, did want to raise snakes and tried it again and again. By this method, however, he did not succeed in rearing "a single blessed snakelet;" but, instead, generation after generation of flies. He found their eggs and watched them hatch and develop from maggots into winged insects and wrote his epoch-making book, De Generatione Insectorum. Thus grafted into an ancient root of error original research has brought forth the new science of life whose fruits we are beginning to enjoy.

This excursion into biological history will not have been in vain, if it serves to make clearer two points. Men must learn to tell the truth and in order to do this must know how to discover the truth before we can have any science. Mental life is nourished and grows strong by feeding upon the truth of nature as physical life is sustained by food. There can be no lasting substitutes for food or truth. If fanciful error, however intoxicating, is rated as good or better than truth of nature, then all science and all sound mental and moral life is impossible. There is a world of philosophy in this; for if the truth of nature is not good enough to live by, then our three score years and ten are so much waste time and life on this planet is not worth the living. We thus come by another road to the same problem—the value of knowledge and education in terms of life itself, and we see that its proper solution depends not only on the truth we teach or learn but as well on the way this is done. This must be by the dynamic method of research. If we attempt to teach biology, of all subjects,

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by the method of stuffing sausages, no matter how good the material, we had better not try to teach any at all. In a word the dynamics of the student are quite as important as the dynamics of the subject matter.

To block out a course in dynamic biology for the college and university is a comparatively easy task. And again, natural, active acquaintance with common animals and plants on the part of all children in the grades is hardly more than a matter of common sense. Biology in the high school—as I have been able to study it—presents the most difficult part of our problem; and next to the absolutely necessary and fundamental nature study in the grades, this is, or ought to be made, the next most important stratum in our plan of biological education. So far as my own observation goes, it would seem that this problem is being solved by those schools that undertake to solve it at all, by giving college biology in the high school. This is perhaps the easiest solution for high school teachers, because most of them are college graduates and practically all the biology they know is what they learned in their college courses. This may be well enough if high school pupils are ripe for college biology and the college is ready to vacate this stratum in favor of the high school. But as this plan is being worked high school pupils are compelled to practically repeat a large part of their course, if they wish to continue the subject in college. This leaves our high school biology between the upper and nether millstones.

Just at present college entrance requirements and examinations have placed the most serious obstacle in the way of developing a rational high school course in biology. All of these that I have seen actually require college biology, and, in fact, along the established type-form lines I fail to see how we can put in a high-school course without either telescoping or crowding college biology ahead. The difficulty thus becomes very real—as Professor Birge once pointedly expressed it to me—"If they teach all these types in the high school, what will we have left to teach in the college?" If I thought it advisable to put college biology into the high school, or rather, if I did not think that a course could be devised much better adapted to high school needs than the college course, I think there would be no difficulty in lifting college freshman biology up a story. But it seems to me that dynamic biology offers a better solution. By its aid we can arrange a course which shall not encroach on the college in the least, and, while having its own distinctive aims, in no way subordinate to the college, it shall lay the best possible foundations for more technically scientific study, if the pupil wishes to go farther.

The high school, as part of the public school system, should

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have its courses co-ordinated with those of the grades. High school biology, under this view, would then form the normal completion of elementary nature study and should aim to fit the great majority who do not study farther for intelligent citizenship in harmony with the forces of living nature. I can hope only to open the discussion of this important question, but from all that I have been able to gather on the subject in the past five years, I am constrained to conclude that the line between practical nature study and technical biology should be drawn between high school and college rather than between the high school and the grades. And I take this position for two distinct reasons. The first is that pupils of high school age are not mature enough and lack the power of thought and the mental perspective to sense the significance of biological types. The note-books may be neat and complete, but when we question the pupils we are likely to find that the underlying ideas have not struck root; *i. e.*, have not found anything in the minds of the pupils with which to form living organic connections. So that I am forced in the main to agree with college instructors who require that the types studied in the high school shall all be worked over again in freshman biology. But when forced to do this the pupils are not only discouraged but disgusted; they take less interest and, in general, derive less benefit from the college work than those who come to it fresh.

The other reason is that there is a large body of biological knowledge, now neglected, which, it seems to me, would prove more valuable to the average citizen and the community than is the body of knowledge now represented by the college course. I was recently informed of a high school class that had spent two-thirds of a year on the anatomy of the frog. Another teacher once said to me: "Most of my pupils will never have any chance to study biology again, and, if I do not give it to them, they will never have the anatomy of the frog. They will then lack even the little remote suggestion that this may give of the structure of their own bodies." I think I see the force of this argument, and still, if its bearing is mainly upon human anatomy, ought not the dissection to be a part of the course in physiology rather than that of general biology? and, at any rate, would it not be more valuable for the pupil to gain a knowledge of the rôle that the amphibia play in the economy of nature? In the one case the knowledge stands in relation to the interests of the community as a whole, while anatomy at best is little more than a means to an end with a special few.

The same argument applies to birds, insects, fishes, reptiles, worms, mollusks and crustaceans and common mammals; to trees and common plants, moulds, mildews, rusts, blights and bacteria. Would not the study of these things as forces in

nature strengthen and enhance the value of studying them later as biological types?

To me the strongest argument for work of this character is that we can adopt the method of original investigation at the start and give the pupils the stimulus which comes from finding out things for themselves. In shifting the point of view from dead structures to living activities, the whole science is rejuvenated. The field bristles with original problems of living and practical interest. No costly or complicated instruments are needed; so that no high school need hesitate to introduce such a course because the community cannot afford to buy microscopes and other apparatus. Minds alive and intent upon what is doing in the world about them and sharp eyes are sufficient in this new field to make observations and discoveries of value to the pupils and the community if not to the larger world of science.

Another advantage is that work of this kind can be carried on without the use of many technical terms, and the students will thus not be required to master a difficult language, the value of which they are not prepared to understand, and one which the majority will have no occasion to use after leaving the high school. Many teachers will appreciate the importance of this point, as well as parents who are annoyed by the, to them, meaningless lingo their children bring home from school. The language centres and memories of the pupils will be sufficiently exercised by learning the common names of plants and animals, with, now and then, a scientific name, in case a common name does not exist.

Permit me to cite a few topics by way of illustrating my point of view. I have in my window a jam bottle with a tumbler inverted over it. The bottle contains about an inch of water with some spirogyra and duck weed in it. A strip of blotting paper is glued to the inside of the tumbler for any insect occupant to alight upon, and a narrow strip of paper is fastened to the outside of the tumbler for my records. So much for the apparatus, which any child can get together without expense. Inside I have had now for sixteen days a single Anopheles mosquito. Aug. 20, I allowed her to draw blood (by placing the inverted tumbler on the back of my hand). The morning of Aug. 23, I found 200 eggs floating on the water. She was allowed to bite again, and Aug. 27, I found 198 more eggs. Again she drew blood, and again laid, Sept. 1, 208 eggs. Another meal of blood resulted in a fourth laying of 182 eggs. She has again filled with blood and to all appearances a fifth batch of eggs is forthcoming. The species is Anopheles punctipennis and it is not known definitely whether this species carries malaria or not. I have been rather

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disappointed in not having a touch of malaria, because I wished not only to settle this point but to obtain a set of blood slides for my class next fall. A few of the eggs in each laying are developing in four tumblers on my study window sill; the rest are preserved in alcohol, enough to furnish specimens of this interesting egg to a class of fifty students. I have simply asked this pestiferous little insect: What can you do? And I have found that she can suck blood and can lay about 800 eggs in sixteen days. I begin to get a glimpse of what one mosquito can do. Suppose these eggs had been laid out of doors and had hatched into, say, 400 female malarial mosquitos to distribute the disease throughout the neighborhood. Then suppose these had succeeded in laying their eggs and so on? Now, follow the subject out into nature, as I have done with my beginning class for the past two years, make a biological survey and locate breeding places, get the records of physicians and see how malaria is distributed about the places where Anopheles are breeding. Then study methods both natural and artificial of controlling this force in nature—all the animals that eat mosquitos in the water, and in the air, birds, bats, frogs and toads, the fishes, newts, salamanders, water bugs, water beetles, dragon fly larvæ, and so on down the list. This is work to keep a class humming and alive with the spirit of genuine research from the start to finish. Then, when interest is keen, the value of lessons on structure and classification is duly appreciated; and the topic may well be closed by reference to books giving the history and fuller discussions of the subject, including the yellow fever problem and that of the coast fevers of Africa. This will serve to show the pupils how they are forging a link in the chain of human knowledge and effort which now encircles the world. Such work students cannot forget. It will become part of their lives, as it is in reality part of the life of nature, and will remain food for both thought and strength as long as they live.

This may serve to show what I mean by a dynamic type. I have outlined the work more fully in my Nature Study, and it is there recommended for lessons in the fifth grade. My object in beginning this particular work so early is mainly to lead the children to appreciate in some degree the value of birds and fishes and other aquatic animals that they are likely to wantonly abuse. But the fact that the study of the type is begun in the grades—and this applies to many other types—is no reason—rather the reverse—for not dealing with it more seriously in the high school or even in the college. In fact, I feel sure I am right when I say that none of this living, dynamic work leaves the stale taste in the mouth of chewing the same cud over again that much of the ordinary anatomical work does.

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There is always something fresh and there is no limit, there is room enough for all. It is like swimming in the ocean, where there is plenty of tide and swell to test the metal of the best university investigator; and still sand beaches and tide pools that are safe and delightful for the children in the kindergarten. I have been working on another dynamic type—the common toad—now for seven years, and I have learned more this last year than I did the first and I hope to continue the study for the rest of my life.

The number of such dynamic types is limited by the number of plant and animal species. For public school instruction, however, I am strongly of the opinion that we should hold somewhat closely to types that concern the ordinary daily life of the community. Of course this principle will not exclude the æsthetic types whose chief or only value is their beauty: for beauty in itself and the cultivation of taste are recognized values of life. I have stated my own views on this point fully in my book and elsewhere so far as the work in the grades is concerned. While this instruction centres rather more closely about the child, his interests and property, and that of his own home, many of the lines of work suggested in my book reach out to wider circles of interest and thus connect the home and the child with the community. With the passage from childhood into youth and as a preparation for the various functions of citizenship, it would seem that we might wisely make the main centre for high school biology the life and interests of the city, town or neighborhood. Then in college and university the student would enter naturally into the universe of pure science. While it is thus helpful, perhaps, to picture the subject as a series of concentric spheres of knowledges and interests—the individual, the home, the community, the world; we must be careful not to allow the delimiting surfaces to become too solid. The bounds in each case are those of our own limitations. The child's interests in reality are those of the universal life, but he is not able to trace them beyond his own little sphere. I am often inclined to think, however, that an even graver danger lies in allowing the centres to drop out and leave science a hollow shell with nothing human in it.

To attempt to give further details and specifications would give this paper the character of a text book of high school biology and to deal with the relations of dynamic biology to the college and university courses would take me beyond my present limitations.

Just now the waters are stirred and the urgent need for radical changes in biological instruction is becoming generally felt. Books too numerous to mention have been produced to meet the demand, but none of them strike out boldly enough. They

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are all written by college and university men, and while some of them contain valuable new and dynamic features, the inclination toward the old familiar ruts has proved too strong, and under new and encouraging titles, they have all turned out to be essentially the old familiar college botany and zoölogy. As a rule high school teachers, while scrupulously trained in details and crammed with facts in college, have not been taught to swim research-wise, and hence, are mortally afraid of venturing beyond their depth. They have nothing to teach except their college botany and zoölogy. They are afraid to tell a pupil: "here is something I do not know; will you help me to find it out?" "Here is a lady beetle. Nobody knows what species of plant lice it will eat; how many it will eat in a day; how many eggs it can lay; how long it lives; will you study it for me and see what you can learn and then tell the class about it? "Yonder is a nest of chipping sparrows. You can sit within a few feet of it without disturbing them. Will you tell us what the parent birds feed the young? How many visits they make to the nest in an hour?" "You have earthworms in your garden. Will you find out how much earth one brings to the surface in a week?" "Here is a tiny maggot that makes it practically impossible for the children in the city, and even our market gardeners, to raise radishes; and here is a bulletin that tells something about it. Will you rear them and preserve specimens of all the different stages you can find or secure and make the subject living and real for us?" Here are fungi enough to go around the class—they are destroying grains, fruits, vegetables and trees. Will you each select one and follow it through its different phases, and then tell us what you have been able to learn?" (A compound microscope is not necessary, even for much work of this kind.)

Permit me to cite a concrete example as it happened in one of the Worcester high schools. The botany class were studying fungi, each member having been assigned a type to work up and report on to the class. One pupil requested the teacher that he be allowed to take the Black Knot instead of the one given him. She was frank enough to say that she knew nothing about it but that she would be glad to have him find out what he could about it, and give the class the benefit. He went to the library and from the last six volumes of The Experiment Station Record copied off onto postal cards the numbers and titles of all the bulletins on the black knot, addressed the cards and within a week had practically everything written on his subject during this time. He then went to work, hunted through the woods and collected the fungus as it grows on native plums and wild cherries and made a survey of enough of the city to enable him to form an intelligent estimate of its

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prevalence on cultivated fruits. He mounted a number of typical specimens in a glass case for demonstration and finally presented his results on the life history, distribution and treatment of the black knot in a carefully prepared lecture which occupied an entire period of the class. A reporter found out what he was doing and presented the subject to the Worcester public in about two columns in one of the local papers.

This account is not complete without adding that the lot next to this young man's home contained a plum orchard of twenty trees in the last stages of destruction from black knot. This was a menace to his own trees and to those of the neighborhood. Since the people who rented the place knew and cared nothing about them, he made out and got signed in duplicate an agreement to treat and care for the trees for half the product. His father later bought the lot on which the trees stand, and they are now in vigorous bearing. The young man has just given me a list of ten prizes that he has taken for plums in fairs and horticultural exhibits. He is now about to enter his senior year in college and has the fixed ambition to prepare himself to teach biology. I recently asked him: "What do you think of the work you did on black knot in the high school? Was it a waste of time?" "Well," he said, "it exactly fitted my particular bent and on that account, I think I got more real good out of it than from any other one thing in my high school course."

I have discussed this subject with scores of high school teachers and I have found two characteristic reactions. Practically all of them believe in and would like to do this kind of work. Many say: "This is all very fine, but I do not know anything about these things and I can't teach anything I do not know. I cannot be telling my classes all the time: I do not know this, I do not know that. I would soon lose my job. I must 'change the subject,' dissimulate or even lie rather than say 'I don't know.' You know perfectly well that people think a college graduate ought to know everything. We are obliged to take people as we find them and work the delusion for all it is worth."

The other class of teachers say: "Yes, this is the work we ought to be doing in the high-school; but there is the valley of the shadow of death, the technical college requirement examination, ahead of my pupils. If they cannot describe the sporogonium and the sporophyte and gametophite generations of Marchantia polymorpha, the protopodite, exopodite, endopodite and branchiopodite of Astacus fluviatilis or Cambarus; the number of segments in the body and the number of joints in the leg of Caloptenus femur-rubrum and Musca domestica; tell all about the foods, habitats and distribution of Nerreis virens,

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Autolytus, Lepidonotus, Amphitrite, Serpula, Nephelis and Clepsine, and so on *ad infinitum;* they may fail to 'pass,' or enter college with conditions, and I shall lose caste and my school will be disgraced.'

This is what I mean by saying that college entrance requirements and examinations as they are now being formulated present the most serious obstacle to a rational high school biology. As I have studied them, I have often said to myself, "we college instructors must be doing this in our sleep and while dreaming that we are setting examinations for our college students."

Here are a few examples from my collection of such examination questions:

"How do you know that the protoplasm of the plant and animal cell is identical?"

Discuss the "ovule and pollen in the reproduction of plants."

Discuss "the leaves of insectivorous plants."

Discuss "respiration in plants and how to show it experimentally."

Discuss "the general path of ascending water (sap) in the stem, and a way in which this path may be shown experimentally."

"Of how many segments is each foot (of a beetle) composed?"

"How many segments in the leg" (of a fly)?

"How many segments in the leg" (of Lithobius)?

"How can you homologize with one another the swimmerets, the legs and the mouth parth" (of the crayfish)?

"What is the gill formula of the animal in hand" (crayfish)?

Are not all of these typical questions in college botany and zoölogy? And I might add: are not many of them to the discredit to these subjects as they are commonly taught in college?

I do not relish being dubbed a "nihilist" or a "distructive critic;" and it does not seem just to the suggestions of a positive character offered above that such should be my lot. But to make assurance doubly sure, permit me to give a few specimen questions that seem to me suitable for college entrance requirements:"

Describe the flowers and fruit of the white pine, stating the seasons at which the flowers appear and the seeds are ripe. (Substitute the names of about thirty of our most important forest trees for as many questions.)

Discuss the poisonous plants of your locality and methods of dealing with them.

What weeds are outlawed by your State?

What native plants are in danger of extermination and what methods should be adopted to prevent this?

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Name the ferns with which you are familiar.

Define the functions of leaves, stems and roots.

Name the parts of an apple blossom and tell what function each performs.

Describe the black knot and methods of dealing with it. (Substitute the names of about forty common parasitic fungi—moulds, blights, mildews, rusts and smuts—for as many questions.)

How may an epidemic of typhoid fever be caused? How prevented?

Describe the food and feeding habits of the common toad.

Name the frogs, tree frogs and salamanders with which you are familiar.

Discuss the food and economic status of the robin. (Substitute the names of about one hundred of our more important birds for as many questions.)

Outline the laws for the protection of game and insectivorous birds in your State.

Describe the life history and natural enemies of the codling moth. (Substitute the names of about one hundred and fifty of our most important insects for as many questions.)

With what fresh water fishes are you familiar? Give the spawning habits and season (of any one of about twenty common species).

If a committee of college instructors could be brought together and it could agree upon a carefully prepared and thoroughly discussed plan of entrance requirements in biology along lines approximating those indicated by the above questions, it would be in my estimation the greatest service the college could render to the public and to the secondary schools. A separate paper might be written upon the influence the body of knowledge underlying such requirements would exert upon the life of the country and the way in which it might bridge the wide gulf which now separates science and everyday life. Students might then come to the college alive and eager to grasp the tools and avail themselves of the resources of science, because they had actually begun to wonder how the infinite variety of living forms could be reduced to an orderly system. Such an upheaval of new life as there would be might rattle some of the dry bones in high places, but that would not be the least of its advantages. If colleges are to continue to educate teachers for secondary schools, the sooner we can shake our courses out of the condition of dry rot and give our students something to teach, the better. To complete this discussion I hope, ere long, to present a companion paper on dynamic biology in the college and university.

To those high school teachers who cannot bring themselves

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to think that the theoretical relations are not the most important part of their courses I beg to suggest that they read their Darwin and note how he arrived at his great generalization by just such studies as I advocate. It is his *method* that we should strive to give to our students and then we can let the results take care of themselves. Darwin, himself, opened up the field of dynamic biology by emphasizing the fact that small forces enormously multiplied and working continuously accomplish inconceivably great results. His work upon coral reefs and especially on earthworms and the formation of vegetable mould are typical cases in point. And with the latter it is significant to note that it was one of his earliest scientific interests, that he kept it alive to the end and finally brought it out as his last great contribution to science. By an application of his method a like revelation awaits the study of an infinite number of other common forms.

And finally, to teach laborious and technical schemes of classification before the child has anything that he knows or cares to classify; to give minute details of internal or external structure of things the child has never heard of (and will never hear of again, if he can help it); to present abstract relations to minds that know little about the things they relate; to propound world encircling theories to children who have no adequate knowledge of the facts they attempt to explain: Do these things not suggest trying to feed babies with the combings of gray hairs?

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LITERATURE.

The Child, His Thinking, Feeling and Doing, by AMY ELIZA TANNER. Rand, McNally and Co., Chicago, 1904. pp. 430.

This is a book without a theory, its aim being to present in condensed form a summary of the work thus far accomplished in child study, to state the few general conclusions which can as yet be formulated, and to indicate to some extent the lines along which work is especially needed. To each chapter is appended a list of literature on the topic discussed, which includes both standard works and articles published in periodicals. Bodily growth and development in their relation to mental development as affected by both normal and abnormal conditions are first considered.

A short chapter on the feelings and ideas of sex in children emphasizes the need of wholesome instruction in this line as a protection and safeguard to the child.

Under mental growth, sensation, perception, memory and reasoning are discussed, and there are chapters on moral and religious ideas, imitation, interests, rhythm, music, drawing and play. The chapter on music gives in an interesting way the results of song composition in the experimental work done in the Elementary School of the University of Chicago. The book is adapted for use as a text book, and hints for methods of study taken from the most successful work already accomplished are given in each chapter. As a whole, the book summarizes in simple and readable form the present condition of child study.

THEODATE L. SMITH.

Not in the Curriculum, by Two Recent College Graduates, with an introduction by Henry Van Dyke. Fleming H. Revell Co., New York, March, 1903. pp. 100.

This little volume is the outgrowth of the college experiences of two graduates of Princeton, who have taken this means of passing on to other students some of the educational values of college life which lie outside the curriculum. It is advice to students from those still near enough to college life to be in full sympathy with it, yet with enough perspective to appreciate some of the best things to be gained from it more fully than those still in the midst of it. It discusses friends, social relationships, study, athletics, use of money, practical Christianity, or in a word, the factors which make college life count not only for intellectual growth but for all that is strongest, best and manliest in the development of character.

THEODATE L. SMITH.

A History of Education in the United States, by EDWIN GRANT DEXTER. The Macmillan Co., New York, 1904. pp. 656.

There was certainly a good opportunity to improve upon Dr. Richard Boone's pioneer work on the general history of education in America, which should have been more fully acknowledged as a pioneer. Professor Dexter had, nevertheless, an inviting and, for the most part, open field not hard to work. His sources are mainly Barnard's Journal, Dr. Harris' Reports, the Contributions of Herbert Adams and his pupils, and the Proceedings of the N. E. A. The writer discusses in the first part the beginnings in Virginia, New Netherlands, New England, and the other colonies, the growth of academies, Horace Mann,

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the middle South and West, and then more recent development in the elementary, secondary and high school, organization, with a chapter on text books. To higher education, with chapters on colleges, universities, professional schools, technical and agricultural education, and the preparation of teachers the author devotes pages 223-397. Art and manual, commercial, female, negro, Indian, and defectives' education have a chapter each. Under educational extension, libraries, newspapers, periodicals, summer schools, evening and correspondence schools, learned societies, lyceums, popular lectures, museums, are discussed. Maps show the distribution of normal, medical, legal, theological schools, colleges and universities. The extent of the ground covered by this work is so great that it will create in all those who look to it for special light the impression of superficiality, and yet we can only be thankful to the author for his diligence, and not least, it may be added, for the references at the close of all important chapters, although these perhaps should have been a trifle more select. The N. E. A. in all its sections covers less ground than this book. It seems to fill a real want and bears abundant traces of painstaking industry which every teacher of the history of education in this country will immediately utilize. It would be easy to criticise at almost any point the sins of omission and of perspective, because perhaps to no two minds do all these topics have the relative importance given them here. The gravest criticism, however, is that from cover to cover the work is so purely pragmatic. Dates, programmes, rules, laws and tables abound. But there is another history of education in this country which might be but has not yet been written, and is hardly glimpsed in this volume; namely, the story of the purposes, causes, historic currents, philosophical and religious, and now business and scientific ideals, great educational conflicts—all these elements, which make up what may be called the higher culture history of education, are not touched up in these pages. There is a standard from which, therefore, one book like this might better be called, "Contributions toward Collecting Data for a History of Education in this Country." We know, for instance, almost nothing of any of the matters of which this work treats for ancient Greece, Rome, or, indeed, of the early mediæval schools, and yet we have an educational history of these periods in the field postulated above which is and always will be far more inspiring and instructive to the student of education than the dry material here presented. On the other hand almost any such material as this would, of course, be a godsend to our interpretation of the educational spirit of these earlier times. We have, nevertheless, great reason to be very thankful to Professor Dexter for this compilation.

Joseph Lancaster, by DAVID SALMON. Longmans, Green & Co., New York, 1904. pp. 76.

Principal Salmon has given us here for the first time an excellent account of Joseph Lancaster, 1778-1838. He was a most singularly imprudent, improvident man who probably never enjoyed a fixed salary for six months continuously, and during the last twenty-five years of his life was often in great want. The system of monitors and pupil-teachers was for years believed by many in England to be one of the greatest discoveries of man and it marked an immense extension of education to the poorer classes almost without price. Thus Lancaster was able to collect money from all sorts and conditions of men from the king down. He travelled, lectured, and founded schools far and wide, projected what is now the British and Foreign School Society and its expensive premises, but seemed to lack all financial sense, was impatient at the trustees who attempted to free the institution from the effects of his extravagance, had a great quarrel with the wealthy

and cautious Bell who held more offices than almost any other man and had difficulty in disposing of his wealth and with whom he later violently quarrelled. His long years in America which began so well turned out badly, and after a long, hard struggle with troubles mainly brought about by his own peculiarities he was run over in New York city and died at the age of sixty.

Fifty-five Years Old, and other stories about teachers, by C. W. BARDEEN. C. W. Bardeen, Pub., Syracuse, N. Y., 1904. pp. 216. Pr. $1.00.

Mr. Bardeen is the story writer of American education. He has already written three books of stories of New York school and here prints six short ones. To our mind this is by far his best book. His style is utterly unpretentious and sometimes homely, but there is a sense of reality about the incidents he portrays, and his writings embody the results of so much keen observation of the character and psychic processes of teachers, and everything is described as so real that the stories are most impressive. At the crises when Paul Pembroke's fortunes changed for the better, when he protested before a large commencement audience against a fraudulent diploma, the victory of Sears over the Alpha Upsilon Society and the triumph of Miss Trumbull, are profoundly moving. In the story of the haunted schoolroom we have almost a contribution to hystero-neurosis, while in Miss Fothergill's Protest we have a character of a pushing but unscrupulous girl which we fear is too true to life.

London at School. The Story of the School Board. By HUGH B. PHILPOTT. T. Fisher Unwin, London, 1904. pp. 314.

One main purpose of this timely and excellent book is to show that the question of religious instruction of children is but one of many great questions in which every good citizen and parent should be interested. Another is to urge that educational problems are not for teachers only, as England has been too prone to think, but for the public at large. The problems which the London School Board has lately had to face are many and great, but this work certainly goes beyond Spaulding's volume entitled "The Work of the London School Board," published in 1900 in connection with the Paris Exposition. The author's historical survey begins with an account of the condition of affairs before the act of 1870 organizing the first School Board. After describing the various Boards, the subsequent chapters take up the infant schools, compulsory attendance, religious and physical instruction, evening continuation schools, the training of teachers, industrial and truant schools, training ship, the day industrial schools, schools for the blind, deaf, and other defective classes and the School Board as a social force. Perhaps the most interesting of all the chapters is that which deals with the development of religious instruction which is very largely based upon the German system, although grievous mistakes were made before the present method was adopted. It is certainly a marvellous development, and perhaps Sir George Kikewich may be right in saying that the London School Board has done more in a shorter time for a larger number of people than any other authority in the world, and its reward is extinction. Most English legislation has been of late the result of a compromise between rival religionists. The new authority has an even heavier burden than the School Board. Public control is sure to be given for all schools for which the public pay. The great danger is still the religious one of compelling various sects to pay for the religious instruction of others. There is now a complete educational ladder from the time the child enters school up to the University, under one control, and the new

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authority has the care of a million scholars in London alone, and the yearly expenditure of some twenty million dollars.

Premier Congrés D'hygiéne Scolaire et de Pédagogie Physiologique (1 et 2 Novembre, 1903) *organisé par la Ligue des Médicins et des Familles pour L'Hygiène Scolaire.* Rapports et Communications. Paris, 1904. pp. 277.

The proceedings of this first French congress of school hygiene cover a wide range of subjects and contain many valuable communications and reports. Among them reports on medical inspection; the relative value of work in the morning and in the afternoon; on the amount of time devoted to work and rest among pupils; and on the prevention of tuberculosis in the secondary schools; and also minor communications upon adenoid growths, school baths, the school desk, the co-operation of the school and the family, etc. In several communications the importance of individual health records is emphasized; and the extension to all schools of the present regulations in regard to boarding schools was advocated. According to the circular of the minister of instruction of the 20th of October, 1902, the rubrics included in the physical health test in the latter schools were the following: weight, height, and chest circumference, and these were to be recorded every three months at a fixed date and kept by the physician of the given school.

Dr. A. Moutier, in a minor communication, strongly argued for the need of including in this physical examination the arterial blood pressure, noting the importance of this in relation to certain diseases, especially tuberculosis. While it could not be argued that every one who shows a decrease of the arterial blood pressure is in the preliminary stages of tuberculosis, on the other hand it is true, as he maintains, that every individual in this condition is a candidate for tuberculosis, presenting a soil favorable to the disease.

W. H. B.

The Paidologist: The Organ of the British Child-Study Association. Vol. VI. No. 1. Norman, Sawyer & Co., London, April, 1904. pp. 61.

This is a number of great interest. In the first article W. Boyd, M. A., presents a study of association of ideals in girls and boys between the ages of twelve to twenty. Miss Young collects valuable statistics and constructs some interesting curves on children's saving and spending. Then follows some records of observations on children, an article on child study and the new educational authorities, an account of an investigation circle, and then follow digests of books and articles within the field of the journal.

Les bases scientifiques de l'éducation physique, par G. DEMENY. 2nd ed. Félix Alcan, Paris, 1903. pp. 331.

The writer first discusses the social rôle of education and current prejudice upon the subject, then its various factors. In the second part he takes up the effects of exercise on the vital functions and the conditions of hygienic exercise. Sections are devoted to the effects of muscle culture upon digestion, circulation, respiration, others are upon fatigue, the influence of movement on the form of the body, modifications of the skeleton, of the muscular system, the fixation of the shoulders, thoracic amplification, solidity of the abdominal walls, education of the central nervous system, of the senses and moral influence of physical training in the development of character and control.

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Up Through Childhood, by GEORGE ALLEN HUBBELL. G. P. Putnam's Sons, New York, 1904. pp. 303.

This is a good book. The author's primary interest is in moral and religious education in the Sunday School no less than the common school and college. It represents classes and courses given to Y. M. C. A. and Sunday School commissions and is addressed to those who "feel the responsibility of the teaching office in home and school, and who are striving to train the young to be God-fearing, earnest, and efficient citizens of this land and of the Kingdom which we believe to be eternal." The author discusses the aims, institutions of education, opportunity of life, teacher's preparation, Bible, the child, the senses, attention, apperception, interest, memory, thought, motives, habits, will, faith. The heart of this author and his head are rightly directed. He makes little pretence to special scholarship, and his book contains very few references to literature. There is nothing in it that can offend any partisan or the representative of any doctrine. It is addressed to experts and is, as we said above, a good book.

Wonderfolk in Wonderland, by EDITH GUERRIER. Pictures by Edith Brown. Small, Maynard & Co., Boston, 1903. pp. 123.

These humorous and original animal stories, six in number, and copiously illustrated, are lively and novel. They have evidently been tried on real children. It is a very significant fact that pedagogues and even parents seem now to be rediscovering the marvellous power of the animal tableaux in moulding the mind and heart of children. We cannot escape, however, the belief, despite the admirable form of this book, that the traditional story roots in this field are better than those that are manufactured, however well this is done.

A History of Classical Scholarship, by JOHN EDWIN SANDYS. Univ. Press, Cambridge, 1903. pp. 671.

This begins with the Athenian age, B. C. 600, and includes the Bizantine and the middle ages nearly to 1400, A. D. The Roman age of Latin and of Greek scholarship naturally consumes a large portion of the work, and on the whole it would appear that this book fills an important gap.

Boys' Second Book of Inventions, by RAY STANNARD BAKER. McClure, Phillips & Co., New York, 1903. pp. 320.

This treats radium, flying machines, electrical furnaces, solar motor, food problem, wireless telegraphy, lighthouses, the newest electric lights. It has many illustrations and could not fail to interest any intelligent boy in the topics which it treats. It seems admirably devised to be a thought stimulator.

Investigations of the Departments of Psychology and Education of the University of Colorado. Boulder, Colo., March, 1904. Vol. II, No. 1. pp. 51.

F. H. Clark studies the scope and efficiency of the normal school of the United States; this is the longest and most valuable article. The author concludes that academic and professional study should not be separated. The pivot of all is the child. The normal schools have been too conservative, although in the last sixty years they have done a good work. "Teacher, know the child," is a maxim comparable with the Greek adage, "Man, know thyself." Only those who have won distinction as practical teachers should teach in a normal school. Observation and practice schools are essential, and so are the study of history of education and psychology.

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An Educational Atlas, by CECIL REDDIE with the co-operation of HERBERT HOOPER. George Allen, London, 1900. pp. 16. 5 shillings.

This is intended as a contribution to the normal tertiary (higher secondary) school. It is intended to illustrate in detail the first and third publications in a series of which this is the second. The large charts give the general prospectus, time table for the different terms, the school order as it should and should not be, examination time tables and reports and the boy's kit for tertiary schools including clothes and material. The qualifications for a teacher, too, are tabulated. It is difficult to conceive anything more elaborately worked out in detail than these tables.

A Short Sketch of the Educational Ideals and Methods to be followed in a Normal Tertiary (Higher Secondary) *School, together with a Work-Plan and Report-Form*, by CECIL REDDIE. George Allen, London, 1898. 1 shilling.

This is a national programme for work for English boys from eleven to fourteen, a synopsis of educational science and a form for recording the worth of each boy. Like everything that comes from Principal Reddie, it is extremely interesting, suggestive, and exceedingly systematized.

The Dawn of Modern Geography, by C. RAYMOND BEAZLEY. Henry Frowde, London, 1901. Vol. II, pp. 651.

This volume carries on into the central middle ages the history of mediæval geography, the first installment of which appeared in 1897. The present volume begins with the Norsemen, A. D. 800-1070, then proceeds to pilgrim travel, A. D. 900-1260, gives a full account of Benj. Tudela and other Jewish travellers to the middle of the thirteenth century, commercial travel and geographical theory and description, ending with the year 1260. A dozen interesting maps add very much to the worth of this imposing volume.

Bildungsnöte der Volksschullehrer, von HERMANN ITSCHNER. Theodor Hofmann, Leipzig, 1901. pp. 78.

This author discusses first the problem of the teacher, its basis, outline, and the personality which it is desired to produce. Under the second part, the conditions and their fulfillment, he describes the programme, training of teachers and technique. It is essentially a pedagogue's book, with a number of interesting, illustrated tables. His point of view is essentially Herbartian.

Bessarion. Studie zur Geschichte der Renaissance von R. ROCHOLL. A. Deichert, Leipzig, 1904. pp. 239.

Rocholl has here made a very interesting historical study of the Renaissance. He begins with an account of this movement in Byzantian, and then traces it in Florence, Bologna, Naples, Mantua, with special chapters upon the Basilianer, the Roman humanists, the later paleologists, discussions of Plato, the library and S. Marco, the French Legation, and Ravenna.

An Oxford Correspondence of 1903. Ed. by W. Warde Fowler. B. H. Blackwell, Oxford, 1904. pp. 98.

These chatty and gossipy letters, all of them written in 1903, give us a rather lively picture of certain important problems and especially of the direction of interest of several typical English university students.

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